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The importance of institutional capacity in drinking water supply system governance: A policy evaluation from border area

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Abstract: In most developing countries, the equal access to clean and potable water is a major challenge faced by many communities. This research aims to evaluate water supply system governance policies as well as potential springs, constraints and problems related to the water needs of border communities. This research is a descriptive study using a qualitative approach. The qualitative approach looks at policies, institutions, conflicts, and problems faced, as well as looking at data on water sources, socio-economic challenges, culture, and local wisdom. The research location was in Belu Regency, on the Indonesia-Leste Timor border. Research informants were representatives of local government, academics and the community. The problems faced are the underdevelopment of piped networks due to budget constraints, low capacity and quality of human resources, and the absence of specific regulations governing the Drinking Water Supply System (SPAM). The study area has springs spread across 11 subdistricts, with raw water potential ranging from 0.5 to 250 liters per second. Most of these water sources are good for community consumption, but some have not been optimally utilized so that they cannot be fully utilized to meet the needs of the population. The results show that SPAM management policies can be implemented to a certain extent, but have not yet run optimally because they still require capacity building and competence of the apparatus and local communities and an increase in the role of local governments to help implement central government policies in relation to assistance tasks and as a tool for deconcentration of the central government. In conclusion, the potential of raw water sources has not been fully utilized due to the challenges of infrastructure development and the limited capacity of human resources and budgets. Without good management and institutional support, communities will continue to face problems related to access to clean water.

Keywords: *Community, Evaluation, Policy, Water governance.*

1. Introduction

Water is a necessity of life for all living things. In fact, water is one of the main foundations for poverty alleviation, health and welfare and ecosystems for living things in the world[1], [2]. In other words, water is a basic need that the government must fulfill because it concerns the livelihood of many people. Its regulation and management are the domain of the government's authority as a representation of people's sovereignty. Ensuring equitable access to clean water and drinking water is a major challenge faced by many communities around the world [3],[4]. Proper regulation or management is directed towards the goal of maximum prosperity for the people. System management of water supply is the most important aspect of the governance landscape, including regulations, policies, organizational structures, and human resources play an important role in creating effectiveness and sustainability in such a vital resource [5], [6], [7]. The connotation of prosperity as stated in the 1945 Constitution, Article 33, paragraph 2 and paragraph 3, must be interpreted broadly, not only for economic purposes, but for the broader goal of an equitable and sustainable ecosystem.

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Demand for water for household needs is on the rise, among rural communities in most developing countries, including Indonesia [8]. This is often due to weak institutional capacity to create adequate resources and insufficient legal framework that leads to negligence of responsibility and overlapping policies [9]. An estimated 785 million people worldwide still use inadequate drinking water sources1, including wells, springs and unprotected surface water. Most people who rely on inadequate drinking water sources live in eastern Indonesia. Water demand is increasing along with rapid population growth. The government must strive to provide clean water sustainably to meet the needs of the community, as this shortage can hinder the planning and maintenance of water infrastructure and jeopardize effective, reliable and safe water provision for the community [10], [11]. Whereas if institutional governance is able to bring communities to be self-reliant and able to develop and produce clean water, the time and cost previously spent on obtaining clean water can be used for other productive activities to increase value and community welfare [12], [13].

From the economic aspect, it is realized that water entities are natural physical and technical, so the first step that must be considered is the development of water facilities and infrastructure as a key in regional economic development, because it is expected that good regulation will have an impact on improving the level of people's lives and environmental stability [14], [15]. Therefore, the strength of institutional capacity in promoting inclusive and transparent governance is needed for both stakeholders and communities in water management practices and decision-making so as to realize equity and sustainability as a form of fulfilling the fundamental right to the human right to the availability of clean water for all [16], [17]. Beyond the technical capabilities and governance and administrative frameworks of responsible institutions [18],[19], [20], [21], there are many types of water system management including community-based management and privatization that aim to create better outcomes [22], [23], [24]. This is in line with Presidential Regulation No. 59/2017 on the government's commitment to realize sustainable development or SDGs. In this context then the existence of the local government in this case the Drinking Water District Company (PDAM) becomes important because functionally and technically implemented urban SPAM development as a first step of the priority of development to develop non-PDAM SPAM in Belu district in a comprehensive way, namely the construction of water infrastructure next 20 years until 2039 in the district Belu which is a border area, which is based on the existing PDAM performance platform already existing, then is expected to contribute to the implementation of the development plan of the needs of water sector facilities. The Drinking Water District Company (PDAM) is a semi-profit organization that pursues two main functions: seeking economic gain and at the same time pursuing social goals concerning the well-being of the community in general, both at the local and national and global levels. It is based on the law of ownership that most of the assets come from the local government in the operation of its programmes or activities, even receiving funding from the central government under the national SISPAM development policy in the region.

Regent Regulation Number 13 of 2023 concerning the Drinking Water Supply System (SPAM) is the focus of this research and consists of eight articles, where each article is a provision or rule to realize the goals and policies of managing the drinking water supply system in Belu Regency. In this constellation, public administration as an interdisciplinary science and as a study of public policy, legitimizes the function and authority of the state in making any decision, as long as it concerns the public interest. In this relationship, water as a source of life for humans and living beings and as common goods, is included in the domain of state assignment and management as a representation of popular sovereignty. Douglas Rose, 1973: 1170, defines the state, appointed by Goggin, et all, 1995 in a book entitled "Implementation Theory and Practice: states "States are real collections of various sub systems of national and local politics. This means: States are real collections of various sub systems of national and local politics. This definition leads to the justification of the paradigmatic assumption that various national and regional interests concern resources that must be managed jointly by the government, the community and the business world, as a unit. Water Resources Law Number 17 of 2019 on water resources is a concrete and consistent manifestation of the 1945 Constitution Article 33

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paragraph (3) and paragraph (2). However, when traced back, there have been gaps, both empirical, theoretical and normative as reported above, due to inconsistencies with the spirit and soul of the 1945 Constitution. The diversity of gap management methods and preservation of water quality creates complex interactions within various institutions [25], [26], [27]. It is therefore important to identify policy challenges and drivers [28], [29], [30], [31].

Various disharmonies of paradoxical relationships between and among factors of the external and internal environment of the wrong policy, even in many cases there is failure or no implementation of the policies that have been proclaimed (*garbits in, garbits out*) [32]. The various problems and gaps that occur include: (1) Unbalanced rapid population growth with continuously depleting water availability, (2) Extreme climate and rainfall, (3) Global warming pressures, (4) Overexploitation of land, forest and water resources through conversion of forestry land into seasonal subsystem agricultural land or shifting cultivation, (5) Destructive overgrazing of land due to extensive grazing patterns, (6) Low income and purchasing power due to limited capital-intensive activities in the non-agricultural industrial sector, (7) Water policies are one-sided and not directed towards the realization of people's human rights to water, (8) At the policy implementation stage, it tends not to run smoothly because it is not based on a causal theory as a grand theory, middle theory, empirical theory, and methodological weaknesses as a means of reference for achieving goals or results. Therefore, developing a legal framework and investing in the training and empowerment of water professionals should be a priority agenda for the government to maintain and improve institutional capacity and resilience of the overall water supply system [33], [34]. This is because the concept of water management lacks a universally accurate definition and continues to evolve actively [35], [36], [37], [38], [39].

Efforts to solve the problem in the form of formulating, implementing and monitoring problem-solving policies by the government have not been carried out properly, because the policy targets and objectives do not address the community's basic needs for water and the agrarian agricultural sector, which is the community's main livelihood. The handling of such substantive issues is only sectoral and does not involve the role of other related sectors, both intra-governmental and intergovernments. The characteristics of handling water resources problems, especially those concerning water in the Watershed category are very complex, requiring the involvement and participation of many parties to plan and solve in an integrated, environmentally sound and sustainable manner.

Public policy as one of the activities of bureaucratic institutions [40], there are many actors who play a crucial role in solving social problems. Public organizations carry out activities to a goal by using a variety of input or input [41]. Based on the above explanation, the study aims to evaluate the policies and availability of clean water in Belu district and identify factors that affect potential water resources in the Indonesia-Timor East border region. The results of this research are expected to provide useful information for governments and local communities to manage water resources sustainably.

2. Literature Review

Water supply, as a basic need for humanity, carries significant importance. Drinking water supply conveys a crucial guarantee to safeguard the public health, mostly in urban areas where source for drinking water is networked. However, more than 30% of drinking water supply systems cannot fulfill water supply standards set by the World Health Organization (WHO). World Bank countries constructed community water supply systems from 1950s under the planning policy where the government played a key role. Most of these systems are still in service now. Water system accidental damage or informational corruption can generate a large number of casualties and considerable losses [1]. Therefore, these systems are required to guarantee information security and supply integrity. Nevertheless, how to rapidly and accurately detect abnormal states and generate alarm information is a challenge problem.

Drinking water supply system governance refers to the government or public agencies that manage and supervise drinking water supply systems or plants (DWSSs), which provide water supply services for cities. Due to the growing number of complexities of DWSSs, activities of water supply system

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governance have become more difficult and unmanageable. An ineffective drinking water supply system governance could seriously influence people's daily life, even their safety. The System of Systems (SoS) concept is recognized as a large and complex system that comprises many independent complex systems. On the one hand, drinking water supply systems can be regarded as complex systems due to their diversities, uncertainties, interferences, and the evolution of constituent elements. On the other hand, drinking water supply systems can be integrated into drinking water supply system governance, which can be considered as a system of systems [3]. Therefore, a system of systems' non-gain governance modeling approach for drinking water supply systems is proposed.

Drinking water supply system governance encompasses the frameworks, policies, and processes through which water supply systems are managed and regulated. Effective governance ensures the equitable distribution, sustainability, and quality of water resources. This literature review examines the evolution of water supply governance, the challenges faced, and the strategies implemented globally to enhance governance in the drinking water sector. The governance of drinking water supply systems is a critical area of research that has garnered significant attention in recent years due to the growing challenges faced by water resources worldwide. Researchers have examined various approaches to governing community drinking water systems, highlighting the limitations of purely public, private, or self-governance arrangements [42].

Governance of drinking water systems has evolved significantly over the centuries, influenced by socio-political, economic, and technological changes. Early water systems were often community-managed, with local governance structures ensuring access and maintenance. With urbanization and industrialization, governance shifted towards centralized systems, often managed by municipal or state authorities [43]. One key issue that has been identified is the tension over the role of different levels of government, from the central to the local, in providing and maintaining drinking water infrastructure [44]. In some contexts, such as northern India, there is a long history of the state being responsible for developing water supplies for the people, with various regimes advocating different combinations of centralized and local responsibility[44].

Improving the technical and administrative capacity of water governance institutions has been suggested as a way to enhance the sustainability of drinking water systems, particularly in the Global South [19]. However, the lack of appropriate institutions, corruption, and bureaucratic impediments have been identified as significant challenges in many developing countries [9]. Community-based management approaches empower local communities to manage their water resources, fostering local ownership and accountability. This approach can be particularly effective in rural and underserved areas where centralized systems may be less viable [45].

3. Research Method

This research is a descriptive study using a qualitative approach . The qualitative approach looks at institutions, conflicts and problems faced, while the quantitative approach looks at data on water sources, socio-economic challenges, culture and local wisdom. The research location was in Belu Regency, on the Indonesia-Leste Timor border. The data collected came from all primary and secondary data obtained from informants from agencies in Belu Regency.

Researchers conducted a survey asking informants directly about water sources, socioeconomic challenges, culture and local wisdom to collect data. The stages of data collection were registering enumerators and coordinating the implementation of research activities, contacting informants, meeting with identified research participants, making all research participants understand the purpose of the research, and determining the date and location of the research.

4. Result and Discussion

The limited fulfillment of clean water sources in Belu Regency can be seen from the comparison of the total population at the end of 2022 of 227,866 people (59,804 households) with the number of PDAM drinking water users only 35,220 customers or 15% of the number of households [46]. The rest

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of the community gets clean water from dug wells, springs, rivers and embungs and dams. The continuity of service of PDAM Belu Regency in one day is 18 hours. This is due to the seasonal capacity of water sources, and the relatively hilly topography of the PDAM Belu service area.

The people of Belu Regency feel the difficulty of clean water because the rainy season is very short, only occurring 3-4 months a year, while the existing rivers only flow during the rainy season. During the dry season, many rivers experience drought. This is a fundamental problem for the people of Belu Regency in accessing clean water that is suitable for health.

Table 1.
Drinking water service coverage in belu regency 2019-2023.

No	Descriptions	Drinking water service coverage per year (Number of households)				
		2019	**2020**	**2021**	**2022**	**2023**
1	PDAM	4,510	4,790	5,061	5,496	6,036
2	Non PDAM (PAMSIMAS)	1,120	2,045	3,636	4,386	5,224
3	Non PDAM (Rural)	1,567	2,078	3,152	4,741	6,355
4	Total households served	7,197	8,913	11,849	14,623	17,615
5	Total households in belu regency	48,061	47,364	54,831	56,387	58,330
6	Percentage of clean water service (%)	14.97	18.82	21.61	25.93	30.20

Source: SIPD, Dinas Pekerjaan Umum dan Perumahan Rakyat Tahun 2023.

The status of drinking water service performance achievements in Belu Regency in 2023 is 30.20% of households that have sustainable access to decent clean water sources in urban and rural areas. This figure is still far from the national achievement access. Nationally, households with access to safe drinking water only reached 90.7% in 2021. Access to proper sanitation is around 80.2% [47]. The Government's target in 2030 is to achieve 100% access to clean water and proper sanitation. The drinking water supply system in Belu Regency is mostly served by the government through PDAM (Regional Drinking Water Company), and a small portion by private parties and individuals.

4.1. Spring Potential

The Belu Regency area has springs that are scattered in 11 out of a total of 12 sub-districts. In terms of quantity, the potential for raw water from a source of water ranges from 0.5 litres per second to 250 liters per second. In terms of quality, most of the available water resources are sufficient for human consumption. Most springs experience a drop in discharge during the rainy season in August, September, October, and November. Table 1 shows groups of springs that have not been optimally utilized (no networks or services) and are potentially to be developed to meet the raw water needs of the population in the Belu Regency.

Table 2.
Potential springs in belu regency.

Sub-district	Village	Raw water source name	Observed seconds (L/sec)	Potential discharge (L/sec)	Condition
Tasifeto Timur	Halimodok	MA Wekaban	3.00	2.10	The distribution reservoir is in a state of disrepair and not currently in use
Tasifito Barat	Derokfuren	Wehedafehan	1	0,70	Provision of Community-Based Drinking Water and

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Sub-district	Village	Raw water source name	Observed seconds (L/sec)	Potential discharge (L/sec)	Condition
					Sanitation Plan
		Tulatudik	1	0,70	In the development planning stage
	Lihat	MA Likis	11.53	8.07	No service yet
Nanaet Duabesi	Dubesi	MA Webot	0,50	0,35	Water supply system is still in the early development stage
	Dubesi	Weuas	1	0,70	Self-help community plan pump
	Nanaenoe	Hutan Kopi	1	0,70	Special allocation fund planning
		Di bawah hutan kopi	3	2.10	In the planning stage
	Dubesi	Tubaki	2	1.40	No existing services yet
Raimanuk	Teun	MA Abatbuti	28.47	19.93	No existing services yet
	Faturika	Wehaneten	2	1.40	No existing services yet
Lasiolat	Lakanmau	MA Molasoan 1	17.60	12.32	Water supply system is currently under development
		MA Molosoan 2	40.48	28.34	None exists yet
	Baudaok	MA Wetihu	246.90	74.07	No existing network yet
		MA Wekaen	2.88	2.02	There is already a shortage of natural power
	Lasiolat	MA Fafakur	1,00	0,70	Not yet used because it is located under the residential area
		MA Fohowai	1,00	0,70	No existing service yet
	Maneikun	Wesubaer	2	1.40	In the planning stage of development
Raihat	Maumutin	MA Wesaseik	1.08	0,76	No existing services yet
Lamaknen Selatan	Lakmara	MA Ilgubul	1.94	1.36	No existing services yet
		MA Giraltui	2.72	1,90	There is no existing service

In addition to rivers and springs, potential sources of raw water in Belu Regency are reservoirs. Existing water reservoirs are used to meet the needs of raw water, irrigation, as well as the needs of livestock and horticultural agriculture (vegetables). Potential raw water storage in Belu Regency includes reservoirs and dams. Reservoirs, commonly called holding pools, are basins located in hilly areas. Water in the watershed is rainwater runoff that falls into the catchment area. The quality of this water needs to be maintained so that it is not polluted by human activities or extensive community farming patterns. Further details can be seen in Table 3.

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Table 3.
Potential raw water sources of reservoirs and dams.

Sub-district	Location	Name of Reservoir/Dam	Condition
Tasifeto Timur	Desa Manleten	Haekrit Reservoir	Sediment dredging required
	Desa Umaklaran	Sirani/ Haliwen Embung	No existing services
Kakuluk mesak	Desa Fatuketi	Rotiklot Reservoir	Water quality is poor, needs to be treated before consumption

Table 3 shows details of the fulfillment of household raw water needs in Belu Regency. The largest supply of raw water is by using house connection pipes provided by the government with a total of 18,232 households, while the lowest is by using old taps with a total of 50 households of protected wells.

Table 4.
Fulfillment of household raw water needs.

Descriptions	Households
Number of households using protected wells	889
Number of households using unprotected wells	0
Number of households using public hydrants	240
Number of households using public taps	50
Number of households using house connections	18.232
Number of households using storage tanks	0

4.2. Local Wisdom

In principle, local communities' knowledge of environmental and climatic conditions is similar [48]. heir knowledge of ecological processes is based on their experience in managing the environment. This gives them a deep understanding of how interactions between humans and the environment can affect their survival and that of future generations. In addition, local wisdom can be a valuable source of information for conservation and natural disaster mitigation efforts [49], [50], [51]. However, local knowledge is vulnerable to changes and losses due to modernization and globalization that can threaten the sustainability of traditional knowledge. Therefore, it is important to maintain and respect local wisdom for environmental conservation and disaster mitigation efforts [52], [53], [54].

Local communities strongly believe that forests play an important role as groundwater providers and water regulators, as well as a source of livelihood for the community. Forests are associated with the presence of springs. Tree density and species are significantly related to the availability of water in the soil. Forests also play a role in maintaining ecosystem stability and reducing the risk of natural disasters such as floods and landslides [55], [56], [57]. Therefore, forest conservation is important to maintain environmental balance and human survival. Forests can provide water through the mechanism of water absorption produced by the roots of trees and plants. Forests also play a role in absorbing carbon dioxide and producing oxygen which is very important for human life. Therefore, conserving forests is an important step in maintaining the balance of the global ecosystem and ensuring human survival in the future.

Communities also have a good understanding of the relationship between plants, soil and water availability. They stated that plants suitable for planting in spring areas have a deep will structure that is able to retain water in the soil, such as candlenut, mahogany and areca nut. They also said that teak is not good for planting around springs, because it sucks up a lot of water and cannot retain water in its roots or stems, but releases it into the air. Plants suitable for planting around springs should be able to

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reduce soil erosion and maintain water quality. Proper plant selection can help maintain the balance of the ecosystem around the spring.

4.3. Institutionals

The institutional situation related to the management of DAS at the Belu Regency level, that is the local institutions associated with DAS management, are categorized into three groups based on their role and interaction with the community: institutions that interact directly with the local community, institutions which do not interact directly with local communities, and institutional groups that take policy [58]. Water management institutions are important forining sustainable river stream management and ensuring sustainable water use for local communities. Therefore, inter-agency cooperation must be strengthened in order to those objectives. Effective institutional mechanisms of DAS management ensure that the needs of the community are met without damaging the surrounding environment. In addition, the active participation of the public in decision-making is the key to the success of sustainable DAS management.

The first group consists of several technical agencies that play a role in the management and utilization of water resources, such as the Municipal Irrigation Office and the Forestry Office. The second group consists of institutions that are not involved in DAS management but are involved in temporary DAS management programmes and are led by other institutions. This group includes the Mining Service, the Environmental Impact Control Agency, the Agriculture Service, Public Employment Service, Village Public Welfare Service, Health Service, Industrial Service, and Agricultural Service. The third group consists of policy makers and decision makers in a number of aspects of development, such as local community representative councils and local governments.

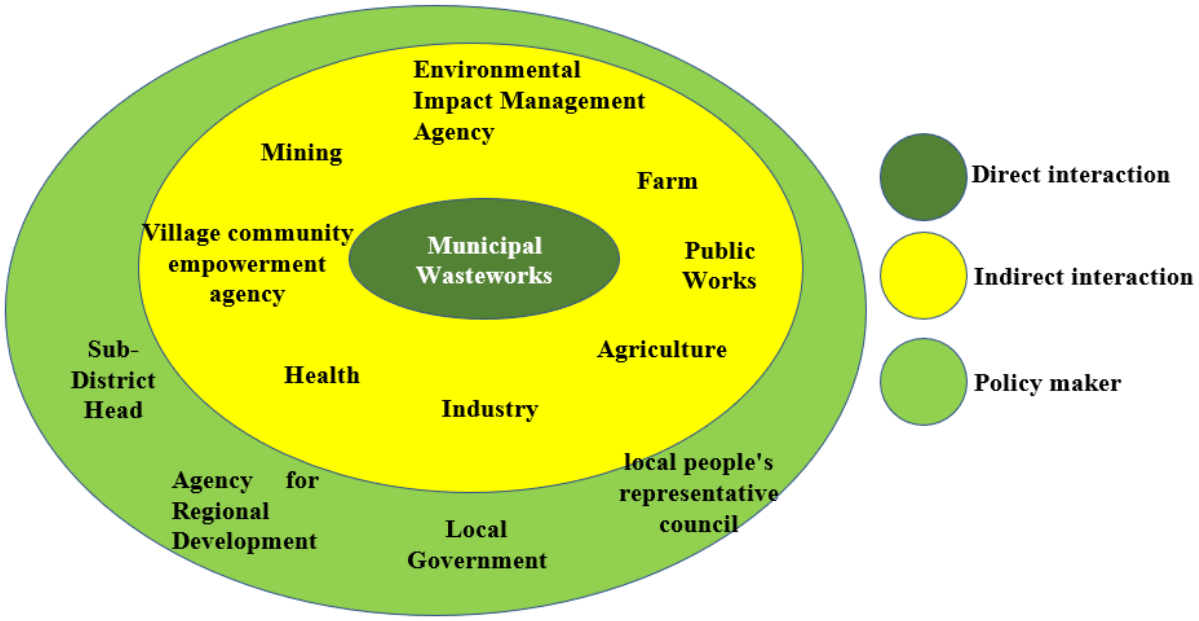

Figure 1.
Analysis of stakeholders in DAS Talau based on their roles and intercations.

In Belu Regency, government agencies that have a strong influence on the management of water resources are the Public Employment Service, Forestry Service, Regional Government, or PDAM which is responsible for managing water resources for the public. Local governments at the district, county, and village levels have an important role in coordinating and regulating the management of river streams at the regional level.

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At the provincial level, stakeholder analysis is carried out to understand the role and importance of various institutions at provincial level in the management of DAS. It is important to ensure that the policies and programmes implemented can the goals desired by all stakeholders. Thus, effective collaboration can be formed to support the management of DAS in a holistic way. Interest party analysis also enables the identification of cross-sectoral collaboration opportunities that can strengthen the implementation of policies and programmes related to DAS management.

Institutionally, it is also necessary to pay attention to the contribution and role of several other important stakeholders, including the Ministry of Foreign Affairs, TNI and Polri, Ministry of Villages, Ministry of Agriculture, and the National Border Management Agency. The role of these institutions in the provision of clean water and infrastructure, border area security, and natural resource management is very important in supporting regional development, especially in border areas. Therefore, inter-agency cooperation and good coordination are needed to achieve sustainable development goals. In addition, such inter-agency synergy can accelerate the development process and improve the welfare of people in border areas. Thus, collaborative efforts between stakeholders have a significant positive impact on regional development.

So far there has been no plan whatsoever for the management of clean water from the springs, however, the MOU and IA for forestry and cross-border DAS management have provided an opportunity for improving the integrated management of transboundary DAS. Thus, a more effective synergy can be created to maintain the availability of clean water and preserve the environment in the region. Collaboration between agencies and stakeholders is essential to achieve this goal, and there must be a strong commitment from all relevant parties [59]. With real action and good coordination, it is expected that the efficiency of clean water management and environmental sustainability in the region can increase.

4.4. Obstacles and Problems

Based on the existing conditions of Belu Regency's municipal water supply, there are factors that become obstacles and problems in developing the water supply system in Belu Regency, namely technical and non-technical factors, as well as supporting factors to overcome them, which are described in Table 5.

Table 5.
Technical and non-technical issues.

Technical issues	Non-technical issues
a. Raw water unit issues: Effect of extreme climatic stress on raw water capacity and continuity, resulting in decrease in the supply of water discharge, sedimentation or siltation specifically for reservoirs, causing the storage capacity to be not optimal.	a. High operational operating costs compared to revenues. b. Technical service coverage is still low. c. Low customer growth rate. d. There has been no replacement of customer water meters. e. Water services to the community are still low. f. The budget for the operating system of water supply support equipment such as pumps and generators is very limited. g. There is still a lack of public knowledge when technical problems occur in the pipeline network or in complementary buildings that can be resolved properly. Community participation and awareness to participate in maintaining and safeguarding

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Technical issues	Non-technical issues
	water supply system equipment continues to be very low.
b. Production unit issues: The raw water unit is not yet equipped with a good production unit. More sophisticated equipment needs to be procured. In addition, the production capacity built has not been utilized properly. Similarly, the real capacity has not been fully utilized.	
c. Transmission unit issues: Direct connection of the transmission pipelines that occur reduce water production in reservoirs such as Fatubenao. In addition to the vulnerability of transmission pipes in forest areas and landslides. Pipes that are deteriorating due to age further increase water leakage.	
d. Distribution unit issues: Sometimes water production is reduced customer service schedules, because the chain of problems that preceded it was not resolved resulting in water shortages.	
e. Service unit issues: Customers do not receive water continuously and sufficiently due to the limited duration of hours water is delivered to the customer.	
f. The water source constructed by the Groundwater Development Project for the community of Weutu and surrounding areas only functioned temporarily, and is now non-functional due to technical and budget constraints for repairs.	

Regarding the existing technical and non-technical constraints, the local government, in this case the Head of the Public Works Office of Belu Regency, said that:

> "...the lack of construction of pipelines and house connections (SR), even many drinking water facilities and infrastructure are not functioning, this happens because of the lack of budget..."

The same thing was expressed by an informant from the Public Works and Public Housing Office of Belu Regency in an interview with researchers who said that:

> "The capacity and quality of human resources is still very low and there is no drinking water management institution in Belu. The mindset of organizers, duties and authorities in drinking water services must be improved. "Also, the understanding of the duties and functions of each activity implementer, as well as the function of PDAM Belu City is still weak, so that the role of guidance and development of clean water supply systems is not optimal and effective..." .

These constraints have resulted in the PDAM not being able to achieve the performance targets that have been set each year, so that it always experiences losses due to high production costs but not in accordance with the income earned. As a result, the quality of the city's water services cannot be improved. Budget limitations are one of the factors causing the decline in service performance of PDAM Belu City. Repairs to existing facilities and infrastructure as well as network maintenance were hampered by budget constraints, resulting in water leakage exceeding 40 percent. In addition, the

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quality of human resources is also limited. In operation, technical assistance is still required in the form of field facilities, equipment, and technical consultant assistance to repair damaged equipment. The government should provide adequate financial intervention to address all technical issues faced by the municipal waterworks in Belu District. The government should also facilitate urban waterways to improve their performance by providing excellent services, as expected by the community. Financial intervention in urban waterworks can also help improve the capacity of human resources involved in their operations.

Some of the main problems related to water resources management, especially clean water in Belu Regency, that were identified are as follows: (1) There is a communication gap between bureaucrats and politicians due to certain motives and interests such as to avoid control over the creation and implementation of over discretion. (2) The absence of a grand theory that obscures the entire process from policy formulation, implementation, monitoring and evaluation of results. (3) Overlapping regulations resulting in implementation failure in realizing normative/legal goals and values. (4) Paradoxical relationship between external and internal factors of water policy; lack of understanding of principles, objectives, functions and authorities in institutional governance or the absence of strong institutions in regulating and managing water resources. (5) Resources (human, financial, social, cultural) are still very limited and have not been fully utilized and managed. (6) Stakeholders involved in water resources management have not been well identified and have not been maximally involved. (7) Government strategies and policies have not yet fully addressed the complexity of water resources management issues. (8) There is no collaboration-based platform or institution.

In addition to the technical and non-technical problems identified, there are also supporting factors in the management of urban water supply systems in Belu Regency, namely the existence of many springs that have the potential to be developed, and the availability of advanced technological equipment that can be used to overcome these problems. However, depending on whether or not there is political commitment, character/statesmanship of the top managers at the government level to develop consensus to create superior policies as implemented by the current reform order government, in overcoming water scarcity in Indonesia, including Eastern Indonesia, through the construction of spectacular water dams, proves that Indonesia has sufficient natural resources, budget and human resources to deal with water problems as mentioned above. According to Prof. Dr. Ignatius Sriyana, MS, an academic from Diponegoro University, Semarang said:

> "…The problem of drinking water does not lie in whether or not there is too much water, but how the water should be used efficiently and effectively, there should be no waste in its use, because water is God's gift to humans and the environment..."

5. Conclusion

SPAM management policies to a certain extent have been implemented, but have not run optimally because they still require capacity building and competence of the apparatus and local communities and an increase in the role of local governments to help implement central government policies in relation to assistance tasks and as a central government deconcentration tool. The supporting and constraining factors are: (a) The existence of regulatory clarity; which is directed at fulfilling the basic needs of clean water for the community, with the highest legal source, namely the 1945 Constitution, Article 33 paragraphs 3 and 2. (b) Human resources that do not have sufficient capacity and competence. (c) Communication between and among the Ministry of Public Works and other related ministries, namely the Ministry of Environment, Ministry of Agriculture, Ministry of Home Affairs and Foreign Affairs. (d) Political commitment and managerial capacity of the government in carrying out its main task of public welfare, as well as the lack of technical expertise of implementers in the management of SPAM in Belu Regency.

The study area consists of 11 sub-districts that have springs with varying raw water potential. However, there are several sources that are underutilized, lack of pipelines, housing connections, low human resource capacity, and the absence of budget limitations. The potential of raw water sources has

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not been fully utilized due to challenges in infrastructure development and human resource capacity. Without proper management and institutional support, communities continue to face problems with access to clean drinking water. These challenges highlight the urgent need to invest in infrastructure and capacity building to ensure sustainable access to clean water for communities. By addressing these issues, communities can improve their quality of life and overall well-being. Investing in infrastructure and capacity building will not only increase access to clean water but also help reduce waterborne diseases and improve overall public health. It is important that communities prioritize these investments to ensure a better future for future generations.

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