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ANALYSIS OF WATER GOVERNANCE IN THE DEVELOPMENT OF RESERVOIR FOR WATER SUPPLY RESILIENCE FOR DRYLAND AGRICULTURE (STUDY IN KUPANG DISTRICT, NTT PROVINCE)

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Abstract:
Air availability has a very close influence on supporting food security. Air is an important input for agricultural production. Due to the dependence on water, many rivers and streams dry up during the dry season. To overcome this community problem, the Kupang Regency government built a reservoir as a water reserve medium. As one of the agricultural barns in NTT Province, it is necessary to analyze water governance in the construction of reservoirs to assess the resilience of air supply for dryland agriculture in Kupang Regency, NTT Province. The method used in this study is a descriptive method with a qualitative approach with a total of 76 people who were determined purposively; then, the primary and secondary data collected were analyzed using data analysis techniques from Creswell (2016). The results of the study found that water governance in the construction of reservoirs for air supply resilience for agriculture in Kupang Regency uses the theory of Van der Kerk et al. (2013:8) with research results on aspects, 1) Uneven information flow, lack of training, and poor strategies hinder water use; 2) No clear roles between institutions, private sectors, and communities in management; 3) Policymakers are not involved in decision-making for water management processes.
Keywords: Water, Reservoir, Agriculture, Dry Land

INTRODUCTION

Currently, the world is experiencing a clean water crisis. Only 1% of the world's clean water can be consumed. Of the 1% of clean water available, not all can be easily accessed by the public (Unicef, 2019). WHO data from 2015 found that 663 million people still have difficulty accessing clean water (United Nations, 2015), while the latest data from the Centers for Disease Control and Prevention (2021) found that 785 million people do not have adequate access to clean water worldwide. About this water crisis, it is predicted that by 2025, almost two-thirds of the world's population will live in areas experiencing water shortages (Centers for Disease Control and Prevention, 2021).

The availability of water is closely related to supporting food security. Water is an important input for agricultural production (World Bank, 2020). According to data, the water potential in Indonesia is currently 3.9 trillion cubic meters per year, while only around 691.3 billion cubic meters can be utilized (Fitra, 2017). Of the water potential of 691.3 billion cubic meters, only 222.59 billion cubic meters per year are currently utilized. The largest water utilization, 79.6 percent, is used to irrigate agricultural land, and the remaining 20.4 percent is used for raw water and domestic and industrial needs (Pandu, 2021).

This is in line with the results of research by the Food and Agriculture Organization (FAO); FAO estimates that globally, 11 percent is for drinking, sanitation and human hygiene, 19 percent for industrial purposes and 70 percent of water is used for agricultural practices (Molden, 2007, FAO,

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2020) in order to achieve food security as one of the Nawacita agendas or 9 agendas for Change from the Government of the Republic of Indonesia 2014-2019. Referring to the General Policy on Food Security, support is provided by developing new or rehabilitating irrigation infrastructure in damaged conditions. Data shows that Indonesia has 9.10 million hectares of irrigated land, consisting of 7.15 million ha of surface irrigation, 1.83 million ha of swamp irrigation (tidal, lowland, ponds), 0.11 million ha of groundwater irrigation and 0.04 million ha of pump irrigation with an average cropping index (IP) of 1.43. Assuming that the per capita consumption of Indonesian people is 139 kg/person/year, it is estimated that the existing land area can meet the needs in question. However, converting agricultural land, especially irrigation, has become a major problem.

Irrigation development accelerated rapidly in the twentieth century, following rapid advances in civil engineering machinery and encouragement from governments and international development agencies. Many developing countries (often former colonies) changed their views on irrigation from supporting colonial agriculture to national policies for employment and poverty alleviation (Suhardiman & Giordano, 2014). Between 1970 and 1990, the world's irrigated land area increased from 184 to 258 million ha. Irrigation development continued; in 1992, the land area for irrigation reached 324 million ha (AQUASTAT 2014 a). Currently, the world's most common irrigation projects are located in Asia (70%), draw from surface water sources (62%), use surface irrigation (86%), achieve a cropping intensity of 130%, and grow cereals (61%) (AQUASTAT 2014 b).

In Indonesia, it is currently estimated that approximately 100 thousand hectares of agricultural land have been converted to non-agricultural use each year (Ministry of Agriculture, 2017). In addition to land conversion, another problem is the degradation of irrigation infrastructure conditions. At the same time, according to PPPSI findings (2018), the agricultural sector in Indonesia is a sector that contributes positively to the national economy. This sector grew by 4.18% in 2014 and contributed 13.38% to the national economy.

Kupang Regency has various potentials. One is in the agricultural sector, which has a value of 47 percent of the total economic activity worth IDR 616.3 billion. Some superior crops in this sector are rice and peanuts. Kupang Regency is one of the areas with high rice production. This makes Kupang Regency one of the rice barns in NTT Province. In addition, peanut production of 2,703 tons or 22.8 percent, is the largest for the province. Kupang Regency's potential in the agricultural sector must be balanced because as many as 85 percent of the working-age population have a livelihood in this sector.

This shows that the production phase of most of the people of Kupang Regency has only reached the subsistence farming stage, a production method with a high level of water needs. Although they work as farmers, the amount of rice fields in Kupang Regency is only 2.69%; the rest is dry land with an area of 180,058 and with the number of rainy days of approximately only 100 rainy days per year (BPS Kupang Regency, 2024) as described in the table below:

Table 1. Area of Rice Field and Dry Land Use by Regency/City, 2024 in NTT Province

Area of Paddy Field and Dry Land Use by Regency/City, 2024								
Regency/City	Rice Fields				Agricultural Land, Not Rice Fields	Not Agricultural Land	Total Land Area	% Rice Fields
	Planted Rice for One Year		Not Plantable	Amount				
	1 time	2-3 Times						
Sumba Barat	7728	1862	0	9590	54224	9928	73742	13
Sumba Timur	10772	8030	0	18802	571292	109955	700049	2.69
Kupang	**14907**	**1426**	**4177**	**20510**	**329768**	**180058**	**530336**	**3.87**

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Timor Tengah Selatan	4999	351	4989	10339	323260	61937	395536	2.61
Timor Tengah Utara	8671	1925	2519	13115	192503	61348	266966	4.91
Belu	5227	975	1	6203	82308	24003	112514	5.51
Alor	621	202	2533	3356	264351	25181	292888	1.15
Lembata	21	36	8	65	118137	8436	126638	0.05
Flores Timur	653	151	177	981	161654	18650	181285	0.54
Sikka	598	1456	5	2059	148546	22586	173191	1.19
Ende	1703	2561	0	4264	185720	14675	204660	2.08
Ngada	3112	4194	0	7306	91815	62971	162092	4.51
Manggarai	3465	8128	0	11594	100995	48909	161497	7.18
Rote Ndao	12192	4137	0	16329	76797	34884	128010	12.76
Manggarai Barat	5230	11663	0	16892	208079	69779	294750	5.73
Sumba Tengah	6515	1086	0	7601	160610	18707	186918	4.07
Sumba Barat Daya	4958	2407	1139	8504	118188	17840	144532	5.88
Nagekeo	4482	1471	1273	7226	97093	37378	141696	5.1
Manggarai Timur	6400	8943	354	15697	210947	37345	263989	5.95
Sabu Raijua	2019	89	123	2231	33364	10608	46203	4.83
Malaka	2637	2168	280	5085	82392	28587	116063	4.38
Kota Kupang	367	44	5	416	6684	10927	18027	2.31
Nusa Tenggara Timur	107277	64305	17583	188164	3618726	914692	4721582	3.99

Source: Kupang Regency Agriculture Service, 2024

Due to the dependence on water, during the dry season, many rivers and streams dry up and to overcome this problem, the Kupang Regency government built reservoirs as a medium for water reserves for the community (Wadu et al., 2023) because the availability of water is closely related to supporting food security. Water is an important input for agricultural production (World Bank, 2020). The largest use of water, or 79.6 percent, is used to irrigate agricultural land, and the remaining 20.4 percent is used for raw water and domestic and industrial needs (Pandu, 2021).

Previous research results found factors inhibiting increased agricultural productivity in Indonesia, namely (1) lack of workforce and weak agricultural extension; (2) inadequate and poorly maintained infrastructure; (3) limited access for farmers to village financing sources; (4) unclear land ownership; (5) technology gap, (6) potential for high-value commodities is neglected (7) inadequate and poorly maintained irrigation systems (7) and weak farmer, water and irrigation institutions; (Purwantini & Suhaeti, 2017);

Previous research findings are also occurring in Kupang Regency regarding constructing reservoirs for water supply resilience for agriculture, such as irregularities in the Provision of irrigation water supply. This is due to the condition of human resources in regulation and distribution, which needs to be prepared. The technical regulation and distribution of facilities and infrastructure such as irrigation water gates (intake), reservoirs, and several infrastructure facilities have yet to be carried out accurately and optimally. They are no longer suitable for use when studied based on the latest irrigation technology.

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In the context of water governance, the lack of clarity regarding rights (water rights) and obligations in water utilization causes water user association organizations to be less effective (Hanak et al., 2011), especially for water supply resilience for agricultural activities (Wadu et al., 2023).

The water governance mechanism in an institution that needs to function properly will ultimately impact the inefficiency of water use and the potential for conflict in water allocation (Wadu et al., 2023). Homer (1994) and Gleick (1993) also stated that the scarcity of natural resources (water) will trigger conflict. Therefore, the management of water needs is not only reviewed from an economic aspect but how water is managed with environmental principles to achieve prosperity with institutional practices in policy-making based on environmental sustainability and equal distribution justice (Koudstaal, Rijesberman and Savenije, 1992) Therefore the research team will conduct a study entitled Analysis of Water Governance in the Development of Reservoirs for Water Supply Resilience for Dry Land Agriculture (Study in Kupang Regency, NTT Province).

Governance-Oriented Public Administration. Public administration is very concerned with achieving good and trustworthy governance. Good governance is realized by the birth of a democratic governance system organized well, cleanly, transparently, and with authority. Democratic governance emphasizes that the locus and focus of power are not only in the government but are shifted to the hands of the people. Good governance is implemented in the constellation between the three components of the people, government and entrepreneurs that run cohesively, harmoniously, congruently and proportionally (Thoha, 2002:68).

In the development of science, administration as governance becomes very powerful in explaining contemporary problems. Public administration is no longer limited by bureaucracy and government institutions but includes all forms of organizations, especially in formulating public policy. The involvement of non-governmental institutions in policy implementation must also be recognized. Moreover, the science of administration as governance places the policy process as the main focus. It is used to study how administrative, political and economic power is used to respond to public problems and interests.

From Governance to Water Governance. The paradigm shift from government to governance has implications for the state, which is not the only dominant actor in making public policy. Actors and institutions play an important role in the policy process. In the governance paradigm, decision-making or policy-making involves all actors in the life of the nation and state, consisting of three main legs: the state or government, the private sector and society (Rogers & Hall, 2003:4).

Along with developing the governance paradigm and the crucial issue of the environment, the concept of sustainable development today also adopts the governance paradigm. This paradigm is believed to facilitate sustainable development by involving many actors who share responsibility for environmental sustainability. The same is true when talking about water management. Water as a public good whose existence is a human right experiences many obstacles regarding water sources and fair water distribution, which can cause horizontal conflicts. In line with this, this study then places the water governance paradigm as a framework for thinking about how the government makes policies in water management.

This is an interesting development regarding the paradigm shift from government to governance, which has resulted in many new concepts regarding governance, be it the concept of good corporate governance used in many private companies as a performance indicator, waste governance as a concept in environmentally based waste management, or water governance as a concept of water management that involves many aspects.

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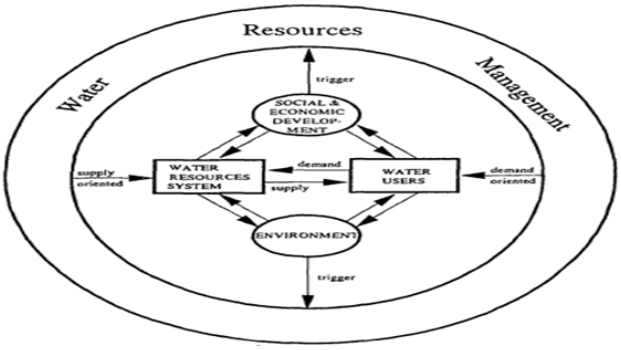
The importance of water, which affects all aspects of human life, makes water management a global issue that will continue to be discussed. Water, as an essential material in human life, is a resource needed by all groups that can cause economic competition and social conflict because of its fulfillment. Therefore, the management of water needs is not only reviewed from an economic aspect but also how water is managed with environmental principles to achieve prosperity with policy-making practices based on environmental sustainability and distribution justice (Koudstaal, Rijesberman and Savenije, 1992)

As explained below, water resource management cannot be simplified because many factors influence and are related, such as economic factors between demand and supply, which are influenced by water availability in the environment and determine socio-economic development. All related elements are like being in a circular loop, where if one part is missing, problems will arise in managing very complex water resources (Koudstaal, Rijesberman and Savenije, 1992).



Source: Koudstaal, Rijesberman and Savenije (1992)

Figure 1. Integrated Water Resources Management Scheme

Water is a limited common pool resource, but its characteristics make it expensive (Levidow et al., 2012). Thus, water governance towards sustainability implies overcoming conflicting policy issues, finding consensus between the interests of the various parties involved within the thresholds set by the ecosystem, and encouraging the use of participatory methods in the decision-making process (Challies and Newig, 2019).

Recently, water management research has shifted to the concept of water governance. However, using water governance in many studies could be more casuistic. The most acute water governance problems are in developing countries, which often suffer from poor hydrological problems, namely frequent floods and droughts, high levels of water source uncertainty, dependence on agriculture and irrigation, high population growth rates and therefore, increasing water needs, low priority of infrastructure for water management, fragile public institutions for water resource management and facing more uncertainties arising from climate change. As a result, more water resource insecurity and deeper conflicts between countries, especially in poor countries (Araral & Yu, 2012).

Local communities in many parts of the world carry out water governance (Ostrom, 1990; Lansing et al., 2017). Social norms of cooperation are key mechanisms for ensuring and maintaining water infrastructure and curbing excessive water use (Lam, 1998). However, most studies on water governance fall into the theory of common-pool resource governance or investment in public goods provision (Gardner et al., 1990). This is especially true for irrigation systems (Tang, 1992). For example, farmers often need to invest collectively in infrastructure maintenance so that sufficient water can be retained in irrigation systems and used by community members.

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Much of the literature on water governance focuses on achieving Integrated Water Resources Management (IWRM) goals (Benson et al., 2015; Nshimbi, 2019; Bertule et al., 2018). On the other hand, water governance is not synonymous with water management, which refers to operational activities (i.e., delivery, wastewater management, recycling) (Romano and Akhmouch, 2019), but also includes the definition of priorities, which institutional arrangements are most important and suitable to satisfy them and the sharing of responsibilities among the various actors involved in the process (Homsy and Warner, 2020; Gupta and Pahl-Wostl, 2013).

According to UNDP (2013), water governance is a range of political, social, economic, and administrative systems that develop and manage water resources and water distribution services at various levels of society. Based on this definition, this study examines the political, social, economic and administrative processes that can be used to develop and manage water.

In line with the principle of governance, Miranda et al. (2011) explained that there are several basic models of water management services, namely:

a. Public Provision: The government at every level directly provides water services without intervention from other parties, either through the Water Council or government-owned water companies
b. Private Provision: The private sector provides water services
c. Community-Based Provision: Local communities and non-government groups provide their water services
d. Public Private Partnerships – market-led and community; water provision through collaboration between the private and public sectors
e. Multistakeholder Provision: water management that combines several actors involved from the private sector, government and local communities

From the various definitions of water governance, we can conclude the complexity of the relationship between actors and aspects involved in the concept, mainly related to the multidimensional aspects of economic, social, political and cultural aspects, as well as the involvement of multiple actors, namely government, private sector and communities with interests in the management of water resources.

Water Governance Models. Basic water governance models illustrate that all possibilities can occur in water management, both centralized and collaborative, with multiple actors, including government, private sector and community.

However, regarding water management, it is challenging to determine the composition of governance models that can be called public, private or others. For example, some business organizations (markets) are owned by the government, such as BUMN or BUMD, so they are both public and private simultaneously (van Monfort et al., 2016).

Although there is no single model of effective water governance because it is closely related to local situations and conditions, in this study, the author uses the model of The Core Elements Of Water Governance With The Three Layer Framework from Van der Kerk et al (2013:8) to analyze the application of water governance in the construction of reservoirs for water supply resilience for agriculture in Sabu Raijua Regency, NTT Province. The author uses the water governance analysis model from Van der Kerk et al (2013:8), which states that three layers of discussion are interconnected and inseparable in order to create a solid concept of water governance, namely,

1. The Content Layer, consisting of information, knowledge, skills, strategies/policies;
2. Institutional Layer, consisting of Organization, financing, legislation, instruments
3. Relational Layer involves cooperation, participation, culture, integrity, transparency, and communication.

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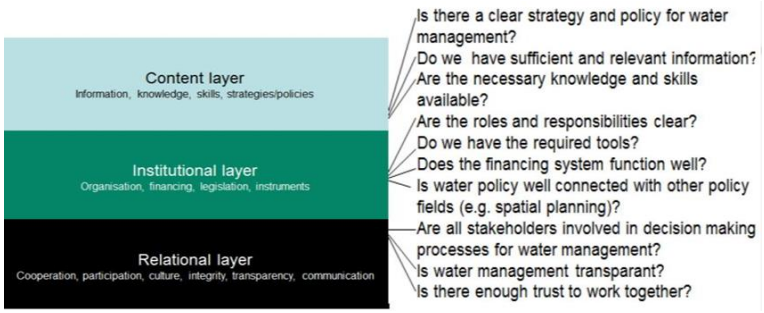
These dimensions or aspects will form a cycle which also becomes a process and influences each other as described in Figure 2.1 below:



Source: van der Kerk, et al (2013:8)

Figure 2. The Core Elements Of Water Governance With The Three-Layer Framework

In terms of seeing whether a regional or state institution has implemented the principles of water governance, van der Kerk has an evaluation method with core elements of water governance, which has three layers of thinking framework to see the principles of water governance are implemented, namely by asking:

Content Layer

a. Information which includes sufficient and relevant information about water management
b. Knowledge and skills concerning the needs related to knowledge and skills in water management are available.
c. Strategies/policies concerning the existence of clear strategies and policies for managing water

Institutional Layer

a. Organization where in the Organization there is a clear division of roles and responsibilities
b. Instruments which are assessed by the existence of supporting facilities

Relational Layer

a. Cooperation concerning whether existing policymakers are involved in decision-making about the water management process

These questions can be useful for evaluating whether water governance principles have been implemented in water management or for determining to what extent the principles of water governance are working.

Reservoir Development Project. According to Schwalbe, translated by Dimyati and Nurjaman (2014:2), a project is a temporary effort to produce a unique product or service. In general, a project involves several people whose activities are interconnected, and the project's main sponsor is usually interested in the effective use of resources to complete the project efficiently and on time. Furthermore, Nurhayati (2010:4) explains that a project can be an effort or activity organized to achieve important goals, targets and expectations using the available budget and resources, which must be completed within a certain period.

A project can be interpreted as an organized effort to achieve important goals, targets and expectations by using the available budget and resources and completing them within a certain period of time (Dipohusodo, 1996:9). In the process of achieving these goals, the allocated cost (budget) limits have been determined, and the schedule and quality must be met (Soeharto, 1995:1-2).

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Rondinelli (1990:6) states that a project is a special type of investment that refers to utility, appropriate size, clear location, introducing something new and the hope that further development can be carried out more efficiently. Meanwhile, according to Gray et al (1992:1), a project is an activity that can be planned and implemented in a unified form by using resources to obtain benefits. These activities can be in the form of new investments such as factory construction, highway construction, railways, school building construction, surveys or research, expansion of ongoing programs and irrigation and reservoirs.

Reservoirs are water conservation buildings in the form of depressions in rivers or water flows in the form of earth fills, rock fills, concrete and stone masonry that can hold and accommodate water for various purposes (Directorate of Irrigation Water Management, Ministry of Agriculture, 2011). Reservoirs are usually built by damming small rivers or can be built outside rivers. The reservoir will store water in the rainy season. Then, the water is used by a village only during the dry season to meet the needs in priority order: population, livestock, and gardens or rice fields. The amount of these needs will determine the reservoir's height and capacity.

METHODS

The method used in this study is a descriptive research method with a qualitative approach. In contrast, the informant determination technique used by researchers in this study is a purposive sampling technique with 76 people. The informants above will be studied using the snowball sampling technique until the data saturation stage. The data sources in this study were obtained through primary and secondary sources. Primary sources are data sources that directly provide data to data collectors, such as interviews with informants. Secondary sources do not directly provide data to data collectors, such as documents, photos, art objects, videotapes or any sound/noise; then the data collected is analyzed using data analysis techniques from Creswell (2016:264-268).

RESULT AND DISCUSSION

Water Governance Analysis in the Development of Reservoirs for Water Supply Resilience for Dryland Agriculture (Study in Kupang Regency, NTT Province). Most of the population of Kupang Regency work as farmers, but it shows that the production phase of most NTT people has only reached the subsistence farming stage, where this production method has a high level of water needs, but during the dry season, many rivers and watercourses dry up and to overcome this problem, the Kupang Regency government built hundreds of reservoirs as a medium for water reserves for the community because water availability is closely related to supporting food security.

Based on data from the Kupang Regency Agriculture Service, the target for rice planting in Planting Season II (April-September 2024) is 1,026 hectares, with the realization of planting from April to May 2024 already reaching 784 hectares. Meanwhile, the target for rice planting in Planting Season I (October 2023-March 2024) is 13,387 hectares, with the realization of planting being 5,979 hectares. Of that amount, the harvest realization was only 4,116 hectares, and the number of rice fields experiencing drought was 443.5 hectares. The Kupang Regency Agriculture Service said there was a decrease in the realization of rice planting area in Planting Season II (September 2024) compared to the Planting Season I period (October 2023-March 2024).

The availability of water for rice fields is also considered very limited. Most of the agricultural land in Kupang Regency is rain-fed rice fields. Climate anomalies, which cause many lands to experience drought, are still a challenge farmers face.

Therefore, to analyze the issue of water governance in the construction of reservoirs for water supply resilience for agriculture in Kupang Regency, NTT Province, the researcher used the theory

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from Van der Kerk et al (2013:8), which states that three layers of discussion are interconnected and inseparable in order to create a solid concept regarding water governance with the following research and discussion results;

Content Layer; Information. Information in the context of water governance of reservoir development for water supply resilience for agriculture in Kupang Regency, NTT Province, includes sufficient and relevant information on water management, and based on the results of research conducted by researchers, it is known that until 2023 there was no sufficient and relevant information sharing on reservoir water management for agricultural activities in Kupang Regency, even a conflict was found over the division of water between users of reservoir water for agriculture.

From the institutional side, it was also found that all decision-making on using reservoir water for agriculture was top-down without involving the community around the reservoir. Good communication in water governance will contribute to effective collective action and the long-term sustainability of water governance (Djumaboev, 2017).

Farmers who utilize reservoirs in Kupang Regency for agricultural activities assume that there is often insufficiency, inaccuracy, and injustice in the distribution of water, which impacts crop failure and decreases farming productivity. Lack of understanding is also caused by a lack of socialization by agencies related to water management activities, such as the Department of Agriculture, PMD and Public Works and Public Housing, so that the water governance mechanism in institutions that do not function properly will ultimately have an impact on inefficient water use and the potential for conflict in water allocation (Wadu et al, 2023).

The findings related to the lack of information related to the construction of reservoirs for water supply resilience for agriculture in Kupang Regency have resulted in less than optimal community involvement in the planning and management of reservoirs in a sustainable manner, even unclear water rights and ignorance and uncertainty about water (Araral and Yu, 2012: 3-9) while the importance of the existence of water that affects all aspects of human life makes water management a global issue that will continue to be discussed. Water, as an essential material in human life, is a resource needed by all groups that can cause economic competition and social conflict because of its fulfillment. Therefore, the management of water needs is not only reviewed from an economic aspect but also how water is managed with environmental principles to achieve prosperity with policy-making practices based on environmental sustainability and distribution justice (Koudstaal, Rijesberman and Savenije, 1992)

Water governance conceptually brings together how public policy is not only the domain of the government but also requires the involvement and participation of civil society and the private sector in utilizing reservoirs in Kupang Regency for agricultural activities and how public policies on water management consider the balance of resources with water needs for the community that still pay attention to the ecosystem and maintain the sustainability of water sources (UN-Water, 2014) or according to van Monfortr, et al (2014) as multistakeholders (multistakeholders Provision) where water management combines several actors involved from the private sector, government and local communities in Kupang Regency with horizontal consultations with cooperative relationship patterns so that there is more openness (Schwab and Kubler, 2001) or there is dependency in the relationship between institutions involved in collective action (Ewalt, 2001).

Knowledge and skill. Knowledge and skill concern the need for knowledge and skills in water management, and based on the results of interviews and observations of researchers, it is known that the construction of reservoirs for water supply resilience for agriculture in Kupang Regency from the knowledge and skill side concerning the need for knowledge and skills in water management has never been carried out either by BWS NT II or the Kupang Regency Government

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through related agencies, while it is useful for improving irrigation water distribution services for farmers and improving the ability of actors who collaborate in establishing cooperation with external parties including the Regional Government or other institutions for the benefit of farmers in Kupang Regency.

Sharing knowledge and skills between individuals and agencies should play an important role in creating new knowledge in the process of sustainable innovation in an institution (Barachini, 2009). The transfer of knowledge and skills from one person to another can also give rise to new knowledge (van Den Hooff & de Ridder, 2004).

The researcher's findings related to the absence of transfer of knowledge and skills in the construction of reservoirs for water supply resilience for agriculture in Kupang Regency are in line with the findings (Mimin & Budhi, 2009; Purwantini & Suhaeti, 2017) where the low management of an irrigation area is caused by factors that hinder the distribution of knowledge and skills in the field, namely; (i) lack of capital, (ii) work programs that are not yet and unclear, (iii) discontinuous coaching and guidance and (iv) low quality of local government support.

Strategies/policies. Strategies/policies concern the existence of clear strategies and policies for managing water in Kupang Regency. Where the strategy begins with research on water conditions in Kupang Regency, showing that in general, water needs include (1) water needs for agriculture (rice, secondary crops and vegetable gardens), (2) livestock, (3) domestic water needs, (4) municipal water needs, (water needs for schools, places of worship, hospitals, offices, hotels, and restaurants) (5), water needs for industry and its development, (6) water needs for consideration of the possibility of water loss. Until now, the availability of raw water in Kupang Regency comes from 2 types of things, namely, existing water sources in the form of reservoirs, springs or other water sources, and water potential that can be developed in the form of surface water (from rainfall) and groundwater (BWS NT II, 2011).

The Nusa Tenggara II River Basin Center (BWS NT II) study found that developing dug wells effectively fulfills DMI (Domestic, Municipal and Industrial) needs. Effective agricultural development is also achieved using water traps (reservoirs) and dug wells on agricultural land (BWS NT II, 2011).

From the policy side, the division of authority and responsibility in water management is regulated in the Regulation of the Minister of Public Works and Public Housing of the Republic of Indonesia Number 14/PRT/M/2015 Concerning Criteria and Determination of Irrigation Area Status in Article 8 paragraph 1 of the regulation.

The criteria for the division of authority and responsibility for irrigation development and management can be seen in the table below:

Table 2. Irrigation Area Authority Criteria

No.	Irrigation Area	Authority/Responsibility
1.	>3000 ha and across provinces	Central government
2.	1000 – 3000 ha and across districts	Provincial Government
3.	<1000 ha	District/City Government

Source: Permenpupr Number 14/PRT/M/2015

In Kupang Regency, until 2024, there are 3 types of reservoirs based on the source of funds for the construction of the reservoir, namely the source of funds from APBD I, APBD II and APBN through BWS Nusa Tenggara II Region so that the strategy/policy for reservoir management in Kupang Regency is that if the reservoir is built using APBD I and II funds from Kupang Regency,

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the institutions responsible for managing it are the relevant agencies in Kupang Regency with the maintenance budget handed over to the PUPR Service of Kupang Regency or using village funds, while if BWS Nusa Tenggara II builds the reservoir, its management is handed over to the village with maintenance returned to BWS Nusa Tenggara II.

The reservoir construction process is carried out by dividing responsibilities between BWS and the local government. In the reservoir development plan in the Regency, resolving social problems and land problems is the responsibility of the Kupang Regency Government. The Nusa Tenggara II River Basin Office prepared the design and sought funds for the construction of reservoirs/bungs; this resulted in a long span of policy control and poor policy strategies, failing to achieve the intention of developing reservoirs for the availability of raw water for agriculture in the region or according to (Araral and Yu, 2012: 3-9) as a policy that is considered short-sighted or an inappropriate policy choice.

Thus, water governance towards sustainability implies overcoming conflicting policy issues, finding consensus between the interests of the various parties involved within the threshold set by the ecosystem, and encouraging the use of participatory methods in the decision-making process (Challies and Newig, 2019), not vice versa, as researchers found in Kupang Regency.

Institutional Layer; Organization. Organization where in the Organization there is a clear division of roles and responsibilities in the construction of reservoirs for water supply resilience for agriculture in Kupang Regency and based on the results of the study it is known that from the organizational aspect there is no clear division of roles and responsibilities between institutions, private sector and the community related to the use of reservoir water for water supply resilience for agriculture in Kupang Regency so that this finding is in line with the findings (Brown and Farrelly, 2009; van Dijk, 2012) that sustainable development of the water sector generally experiences institutional challenges which are reflected in the facts in the field that the community has not been actively involved in the operation and maintenance of Water Resources (SDA) infrastructure that has been built and the performance improvement is still low due to minimal intervention from the government while according to Lam (1998)) social norms in the form of cooperation between organizations are a key mechanism to ensure and maintain water infrastructure and also to restrain excessive water use.

Instruments. Instruments can be assessed by the existence of supporting facilities, and from the results of observations and interviews conducted by researchers, it is known that from the instruments side, the construction of reservoirs for water supply resilience for agriculture in Kupang Regency did not receive assistance in the form of facilities and infrastructure that support the sustainability of the reservoirs, resulting in the reservoirs being neglected, marked by damaged taps, pipes, channels, and currently many reservoirs that are not maintained are experiencing shallowing, reducing the amount of annual water storage and having an impact on the availability of water for agriculture in Kupang Regency. The absence of an operating and maintenance system also results in reservoirs becoming mere monuments.

Relational Layer: Cooperation. Cooperation concerns whether the existing policymakers are involved in decision-making on the water management process (i.e., agricultural water users and political actors selected as components of water governance) are farmers, local farmer group leaders, village representatives, and agricultural facility monitoring officers. As part of the governance component, core actors are important in implementing water governance if they are involved appropriately. Farmers and other core actors are involved in water governance through user associations.

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Based on the observations and in-depth interviews conducted by researchers, it is known that constructing reservoirs to improve water supply resilience for agriculture in Kupang Regency from the perspective of cooperation does not involve existing policymakers in decision-making on the water management process.

Farmers, local farmer group leaders, and village representatives are not always involved in every decision-making activity; it was even found that when decisions have been made, farmers and local farmer group leaders themselves violate the decision such as water theft, destruction of water distribution facilities in reservoirs and unequal distribution of water to the point that in some reservoirs there are no water user associations, farmers are excluded from governance and decision-making, resulting in poor implementation of water governance policies (Mukherji et al, 2009) while according to Djumaboev et al (2017) greater trust and communication within will make an important contribution to effective collective action and long-term sustainability of water use for agriculture as the main objective of the construction of hundreds of reservoirs in Kupang Regency which according to research results (Wadu et al, 2023).

This finding is in line with the findings in the Saemangeum project in Korea, where farmers were not involved or involved in water governance, causing institutional governance to be ineffective (Kim et al., 2017). Thus, the involvement of core actors (farmers and other agricultural water users) as part of the agricultural water governance component is critical to achieving meaningful success in the design of institutional water governance. However, some findings suggest that resource management in various parts of the world tends towards centralization and adoption of science that ignores local practices (Berkes, 2002).

CONCLUSION

Water governance in the construction of reservoirs for water supply resilience for agriculture in Kupang Regency uses the theory of Van der Kerk et al (2013:8) with research results in the aspect (1) content layer constrained by the uneven flow of information, the absence of training to improve the knowledge and skills of reservoir water users and poor strategies/policies, while in the aspect (2) institutional Layer from the organizational side, there was no clear division of roles and responsibilities between institutions, the private sector and the community related to the use of reservoir water as well as inadequate instruments and in the aspect (3) relational Layer on the cooperation side, it was found that there was no involvement of existing policy makers in decision making about the water management process.

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