LOCAL INSTITUTIONS AND SUSTAINABLE WATER RESOURCES MANAGEMENT ON NORTH CENTRAL TIMOR REGENCY

Werenfridus Taena[a] M.M. Endah Satmalawati Mulat S[b] Salesius V. Kolne[c] Ludgardhis Ledheng[d]

[a,b] *Faculty of Agriculture, Timor University, Indonesia*
[c] *Faculty of Social and Government Science, Timor University, Indonesia*
[d] *Research Institute and community services, Timor University, Indonesia*

Email: weren_ntt@yahoo.co.id

Abstract

Natural resource management is carried out by state, common and individual in accordance with the ownership of natural resources. Most of the water resources in TTU Regency are owned and managed together because of their common property. This study aims to: (i) evaluate the role of local institutions in water resources management, (ii) recommend sustainable water resource management strategies and policies. Method of study using survey method. Data analysis using descriptive analysis, and analysis of internal and external factors. The results showed the combination of water resources management by state and common will be sufficient to ensure the sustainability of water resources. Strategies that can be done is the local institutional empowerment in order to make efforts to conserve water resources vegetatively and religion simultaneously.

Key words: water resources, local institutions, sustainability

I. INTRODUCTION

1.1. Background

Water resources are a scarce resource in most parts of Timor Island including North Central Timor District (TTU). A short rainy season (3-4 months) compared to a long dry season (8-9 months). Another factor is the management of water resources that are not integrated, thus causing scarcity of water resources. The law no. 37 years 2014 on the conservation of water resources and land declare water resources are water located on the surface of the earth (springs, rivers, lakes, reservoirs, etc) and water in the earth's surface (shallow wells, deep wells, water basins) .

Most of the water resources in TTU are managed communally. Rustiadi et al (2011) states ownership rights over natural resources are generally categorized as: (i) state property, ownership claims are in the government, (ii) private property, ownership claims are in individuals, (iii) commom property or communal property, individual groups have claims over co-managed resources. Local communities are culturing water resources in customary rituals to preserve water resources. The local community is not allowed by customary institutions to harvest trees near water resources.

Spatial pattern in Spatial Planning of TTU Regency has made water resources as a protected area, but most of them make it as a cultivation area (Regulation of TTU Regency No. 19 year 2008 on Spatial Planning of TTU Regency 2008-2028). The impact of land use changes on land around

the water resources. Determination of water resources as a protected area and cultivation area in spatial planing is part of water resources management by the state.

Water resources management is also conducted in a tribal-based communal, because each tribe in TTU Regency has “oekanaf” (local name of water of tribe). North (1990) grouped institutions into formal institutions and informal institutions. The traditionally developed informal institutions in TTU regency are customary institutions.

Communal water resources degraded because some tribal members, and other residents around the water resources are less adherent to the prevailing norms in relation to water resources management. Communal management collides with the individual's interest to earn income by utilizing the adjacent land to the location of the water resources; in Hardin's (1968) perspective led to the "tragedy of the common". The impact of individual water management began to grow. Design of water resources management policy is needed to integrate community water resources management (communal), state and individual.

1.2. Research Issues

The problems studied in this research are formulated as follows:

1. What is the role of local institutions in sustainable water resources management?
2. How are sustainable water resources management strategies and policies?

1.3. Research Purposes

This research aims to:

1. Evaluate the role of local institutions in sustainable water resources management
2. Recommending strategies and policies for sustainable water resources management in TTU District

II. RESEARCH METHODS

2.1. Location and Time of Study

Research location in North Central Timor District. Schedule data collection in October and November 2016.

2.2. Sample Determination Method

Research sample is determined in stages. Location samples are determined by purposive sampling with the consideration of representing water resources managed by society (common), individual, state. The sample of respondents is also determined by purposive sampling with the consideration of representing local community (adat institution) of water resources manager, government (represented by offices that manage water resources), village government, individual water resource manager. Total respondents were 20 peoples.

2.3. Method of collecting data

The research used survey method. Primary data collection is done by observation, and interview using questionnaire that has been prepared. Secondary data is obtained from related institutions.

2.4. Data analysis method

Data analysis is intended to answer the research problem. Descriptive analysis to know the description of the role of water resources and water resources management. The analysis is carried out with SWOT analysis (strength, weakness, opportunity, threat) as proposed by Rangkuty (2006)

to formulate strategies and policies on sustainable water resources management based on identification of internal and external factors.

III. RESULTS AND DISCUSSION

3.1. Water Resources Manager and Sustainability

Water resources management in TTU Regency is conducted by individual, common state. Cooperation between state and common management is also often done, such as: farmer groups and communal communities owners of certain springs. Water resources management is exploitative or maintains its sustainability depending on the orientation of water resources managers. Fauzi (2010) states the combination of property rights and access as a form of natural resource management can determine the sustainability of a natural resource.

3.1.1. Water Management by Common

Common water resource management is generally conducted on springs and / or watersheds that function for certain groups of people in a region. Common role in the management of water resources is the institutional customs and farmer groups. Wheater (2015) stated the management of water involves the management of a complex human-natural system.

Customary institutions in North Central Timor Regency is an institution that grows and develops in people's lives. Indigenous institutions are formed by tribes that have their own roles in customary institutions. Customary institutions consist of usif (king), amaf-amaf (king's consideration council), tob (people). Each tribe has its own water source. Social learning includes the governance structure and the natural environment (Craps et al., 2007).

One of the roles of indigenous institutions is to conserve natural resources, such as: forests and water resources. Maintenance of water resources by customary institutions is generally carried out on the source of the springs that are saved by each tribe (*oe kanaf*) and rescued each kingdom for the *lol ton / eka hoe'e* ceremony. Water resources management must meet social, biological and physical interests as stated by Kodoatie and Sjarief (2010).

Management carried out by the community or government by involving the community owners of springs and / or the surrounding community is generally more sustainable. This condition occurs because the perceived benefits of the surrounding population are not only economic benefits, but also social and cultural benefits. Aboniyo et al (2017) stated water management promotes the coordination and management of water, land and related resources to maximize the economic and social welfare in an equitable manner without compromising the ecosystem.

3.1.2. Water Management by State

Water management by the state in TTU Regency is done through Regional Water Company to distribute water for housing. Local water utility companies to distribute water and ensure minimum water needs for decent living for the urban and surrounding communities. Good governance including a strong liaising at various levels between people and the authorities is a prerequisite (George A et al., 2009).

Water for agricultural manage by public works department, agricultural and forestry department. Then water managers in the community are farmer groups and water user farmer associations. Mostert E (2006) stated originally, water management was the responsibility of the individual land owners and local communities. However, many swamps were drained. This resulted in soil subsidence and necessitated supernocal flood protection and drainage.

Water management by state emphasizes on utilization aspect; while the sustainability of water resources is less of a concern, that causing some problems to the environment. Farmer groups

generally develop horticultural and food crops that have low conservation functions, compared to plantation crops and other longevity crops. As put by Oorthuizen (2003), many disasters of resource management have been caused by replacing effective community management with ineffective or corrupt government management.

Therefore, the Government of North Central Timor Regency began to draft the Regional Regulation of Water Resources Protection and Management. The law provides for the rights and obligations of individuals, communities, enterprises and the state in the protection and management of water resources, to available in sufficient quantities continuously. The same as harmony theory stated by Qiting Z et al (2013) include (i) harmony between humans and nature; (ii) a harmony strategy for water resources management; (iii) a rational allocation model for water resources between different areas and departments based on harmony theory.

3.1.3. Water Management by Individuals

The drinking water business by using water tank began to develop almost in all areas of TTU regency. The water utilized is sourced from deep ground water at several locations in TTU Regency, whose ownership and management are individualized. The same condition occurs in shallow groundwater management that is available in some homes. Blomquist et al (2004) stated the observations that the institutions are important and inextracted.

Individual water management is also undertaken for bottled drinking water businesses and several drinking water refilling venues using gallons. This condition indicates the beginning of privatization of water resources and drinking water business began to promise in the area of TTU Regency. Research conducted by Grady C and Younas T (2012) states that the water bottling indutries that produced bottled water in certain locations and then export it to distant lands for consumption.

Water management by individuals entities with a view to maximizing profits, so it is feared someday the sources of springs that have socio-cultural value began to shift to economic function. These conditions allow for the development of environmental services mechanisms. Prasad N (2007) stated both theory and evidence show the ambiguities of privatisation of water service, and that the absence of effective regulation makes privatisation infeasible in developing countries. Apart from the desire to seek profits which is still prevalent, the main drivers for increased private sector participation today are poor performance of public water companies, lack of public finances, donor conditionalities, aims to increase efficiency, etc. However, history warns that water cannot and should not be treated merely as an economic good, but other dimensions like the political, socio-cultural, technological, environmental and legislative should also be considered.

3.1.4. Combination of Common and State Water Resources Management

The combination of water resources management by the common and the state into a solution to realize the sustainability of water resources. Demtesz (1967) in a new institutional economy that requires the need for institutional environment and institutional arrangement. Good institutions form a pattern of community behavior, create a good order and reduce uncertainty.

Common water resources management in TTU Regency generally relies on customary rituals with the intention to impose custom sanctions on parties intentionally and unintentionally destroying trees in the spring. Oii et al (2010), states that social and cultural components have a norm that binds everyone in the institution. Obstacles common as the owner and managers of water resources sometimes convert land around the springs into cultivated land (food crops and crops).

State through local government and village government further provides awareness of customary institutions (common) in order to contribute to preserve the water resources; because the

water is not only beneficial to the owner of the springs, but the people residing in other areas. Craps et al (2007) stated Stakeholders at different scales are connected in the flexible networks that allow them to develop the capacity and trust they need to collaborate on formal legal structures and contracts to informal, voluntary agreements . In addition, more conservation land use in the area will help preserve the springs for the next generation.

Kartodihadjo`at al (2000) states institutional innovation through proprietary rights is needed to control interdependence between people against a particular situation. Each institutional model has a set of rules governing the granting of powers and responsibilities that stakeholders must take as actors. Combination of management by common and state is an innovation to realize the sustainability of water resources. Commodities are cultivated for this combination of management by cultivation of conservation crops on a certain radius.

The water catchment location is used for horticulture crops, and when the water is abundant it is also used for wetland farming (farming) and freshwater fish cultivation. Aboniyo et al (2017) stated that water resources management is a fragmented way and the level of control is sophisticated without taking into consideration the management of water resources at a catchment level.

Ostrom (1990) states institutional changes are classified into 3 namely: operational level of rule, level of collective choice rule and level of constitutional choice rule. The operational level of the government's rule distributes seeds for land rehabilitation (reforestation) through technical intansi. The government also conducts counseling and guidance to farmer groups in order to preserve the water source by cooperating with common water source owners.

3.2. Formulation of Water Resources Management Strategy and Policy

The management of water sources is determined by internal factors and external factors. In harmony with Eaton (1986) which states institutional is determined by 2 (two) groups Factor namely Internal Factor and External Factor. The identification of internal and external factors will form the basis for formulating strategies and policies for water resources management.

3.2.1. Identification of Internal and External Factors

1. Internal factor management of springs

Strenght:

a. Being in a forest area
b. Customary institutions play a major role in the management of springs

Weakness:

a. Cultivation of slash-and-burn near the springs so that the critical land is wider
b. Commodities cultivated near springs are generally food crops
c. the dissolution of local cultural values in the management of springs
d. Lack of law enforcement

2. External factors management of springs

Opportunities:

a. The government establishes the spring as a protected area
b. Local governments will establish regional regulations for water resources protection and management
c. National and international programs on environmental conservation including water resources
d. Certain institutions provide seeds for reforestation in the spring

Threat:
a. Climate change
b. Land conversion
c. Claims from certain parties after the location around the springs become greener

3.2.2. Formulation of Water Source Management Strategy

The identification of internal factors (strengths & weaknesses) and external factors (opportunities & challenges) forms the basis for determining strategy formulas. The formulation of spring water management strategy is grouped into four quadrants as stated by Rangkuty (2006).

Quadrant I is a strategy to harness the power to capture the opportunities that exist. The strategy formula is as follows:

a. Payment mechanism for environmental services

Customary institutions and communities living around the springs should receive sufficient economic incentives to maintain the preservation of springs and water catchment areas. The Government can facilitate the mechanism of payment of environmental services for the parties (including the common) that preserve the water resources. Giordano and Shah (2014) stated the effect of environmental servicees is that they grow and lose their land if they disobey government planting orders.

b. Reforestation in water catchment areas

Communities that benefit from certain water resources have a moral obligation to reforest the catchment area including river borders. Regional Spatial Plan (RTRW) of TTU Regency states that the area with a radius of 200 m from the spring is a protected area so it must be greened; while the river border with a radius of 50-100 m is mandatory for greening. Types of trees for reforestation of water catchment areas also need to be selected to function optimally to preserve water resources.

c. Preparation of village regulation of protection and management of water resources

The determination of the regulation of water resources protection and management in TTU Regency can be translated into village regulations by every village in TTU Regency. Yu X et al (2015) stated synthetic approaches to solve water problems in rurals are proposed with regard to institutional reform, regulation revision, economic instruments, technology innovation and capacity-building.

Quadrant II is a strategy that utilizes the power to overcome the threat/challenge. The strategy formula is as follows:

a. Enforcement of rules especially on forest areas and water resources protection areas

Enforcement of the rules that have been done specifically related to the destruction of forest areas, while other protected areas are regulated in Law no. 26 of 2007 on Spatial Planning received less attention. Spatial planning of TTU Regency in 2008-2028 has confirmed that the river border areas and springs are protected areas, but the enforcement of the rules is still weak.

b. Provide conservation farming training

Eco-friendly agriculture becomes a necessity at the moment so that trainings and internships in certain areas that have been able to implement conservation farming will increase the motivation of the population to carry out conservation farming. Conservation farming will be able to maintain nutrients, reduce erosion and reduce surface flow. Ngwira A et al (2014) stated adoption of improved technologies is critical to success of conservation agriculture (CA) program implementation.

Quadrant III is a strategy that takes advantage of opportunities to overcome weaknesses. The strategy formula is as follows:

a. The empowerment of local institutions in water resources protection

Local institutions have evolved in the protection and management of springs. Customary institutions can be given the role to preserve the water resources through the ceremony banul/banut (traditional ceremony conducted to preserve the trees around the springs). Indigenous institutional empowerment is done by counseling and assistance to preserve local culture for the sustainability of water resources. Craps (2007) Collaborative governance is considered to be more appropriate for integrated and adaptive management regimes needed to cope with the complexity of social-ecological systems.

b. Provision of seeds for reforestation through farmer groups and customary owners of water sources

The government can distribute the seeds of reforestation plants through customary groups to preserve the water resources. Indigenous annual events conducted by customary institutions can be preceded by planting and cultivating plants around the water resources location.

c. Detailed plan and calculation of water absorption coefficient

Each water resource shall be planned in detail to determine the extent of the catchment area, the type of reforestation plant, the water reproduction coefficient, the water volume and the extent of the water resources service. An appropriate detailed plan can predict such matters so that the sustainability of water resources remains sustainable. Billib et al (2009) stated management strategies will conserve water from high quality in the main reservoir and will decrease the crop water deficits

Quadrant IV is a strategy that requires the introduction of certain parties to overcome the weaknesses as well as the threat / challenge. The strategy formula is as follows:

a. Formal recognition of the ownership and management of water resources by the common

Government can identify water resources in TTU Regency accompanied by owner and management. Furthermore, it can formalize it for ease in planning, utilization, and control. Rassameethes R (2009) states that the village has successfully managed its water resources as a learning center and has passed on its experience of social learning to manage water resources and develop processes in order to establish a social network.

b. Sustainable development

Development that promotes economic growth is essential to improving the short-term well-being of the population. Sustainable development can be done by applying green economy as one solution to achieve growth, equity, sustainability (the aims of development). Billib et al (2009) stated It can be achieved through: (i) the improvement of the efficiency of flood irrigation, (ii) change to pressurized systems in the shallow and highly permeable soils, and (iii) reuse of drainage water for irrigation within the district.

3.2.3. Water Resources Management Policy

These strategies can be grouped into two water resource management policies in order to meet the needs of the current and future generations. Previously Williamson's (1975) findings on new institutional economics state that the policy of improving human life is a combination of social, economic, environmental and political sciences. The water resources management policy is:

a. Vegetative
reforestation of water sources including catchment areas, known as customary forests. Areas with a certain radius from a spring are not allowed to be cultivated into agricultural land. Customary sanctions in the form of fines against parties that cut trees and convert land around the source of water into agricultural land.
b. Religion
traditional ceremonies addressed to the "Supreme Being" to request protection of water and forest resources. Indigenous peoples have the belief that certain parties who damage the offense willfully and / or unintentional will get a reprimand (sanction) custom of "Supreme Being". Hastrup K (2013) stated an anthropological perspective, water is not only the sine qua non of life in general, it is also seen to configure societies in particular ways, and to generate particular values.

IV. CONCLUSION AND SUGGESTION

4.1. Conclusion

Based on the results of the research, it can be concluded that: (1) a combination of water resources management by state and common make water resources more sustainable than water resources management conducted by individual, common, state separately; (2) empowerment of local institutions in water resources management accompanied by vegetative and religious management policy in preserving water resources.

4.2. Suggestion

Suggestions that can be submitted are based on the following research results: (i) identification of water resources with owners and managers and the extent of water utilization; (ii) the government can distribute seeds for reforestation through customary institutions that have been upgraded, (iii) use more conservation land in water catchment areas and locations around water resources with a certain radius.

REFERENCES

Aboniyo J, Umulisa D, Bizimana D, Pascal JM, Kwisanga, Mourad KA. 2017. National Water Resources Management Authority for A Sustainable Water Use in Rwanda. Sustainable Resources Management Journal 2(3): 01-15

Bappeda TTU Regency. 2008. Spatial Planning in TTU Regency 2008-2028. Kefamenanu (ID): Bappeda TTU Regency.

Bilib M, Bardowicks K, Arumi JL. 2009. Integrated Water Resources Management for Sustainable Irrigation at the Basin Scale. Chilean Journal Of Agricultural Research 69 (1):69-80.

Blomquist W, Heikkila T, Schlager E. 2004. Building The Agenda For Institutional Research In Water Resource Management. Journal Of The American Water Resources Association Desember:925-936

Cole S. 2012. A political Ecology Of Water Equity and Tourism A Case Study From Bali. Annals of Tourism Research, Vol. 39(2): 1221–1241

Craps M, Dewulf A, Mostert E, Tabara D, Taillieu T. 2007. Social Learning and Water Resources Management. Ecology and Society 12(2):5-24.

Departement of Public Works. 2007. The law No. 26/2007 about Spatial Arrangment. Jakarta (ID): Departement of Public Works.

Eaton Joseph W. 1986. Institutional Development and Nacional Development, form concept to Aplycation. UI Press. Jakarta.

Fauzi A. 2010. Natural Resources Economic and Environment, Theory and Aplycation. Jakarta (ID): PT. Gramedia Pustaka Utama.

George A, Pierret A, Boonsaner A, Valentine C. Potential and Limitation of Payment for envoronment services (PES) as a means to manage watershed services in mainland shouthast Asia, Vol 3 (1): 16-40.

Giordano M, Shah T. 2014. From IWRM back to integrated water resources management. International Journal of Water Resources Development, January:1-14.

Grady C and Younas T. 2012. Bottled water technology and its global ramifications: an overview. International water technology journal, Vol. 2(2): 185-194.

Hastrap K. 2013. Water and the Configuration of Social Worlds: An Anthropological Perspective. Journal of Water Resource and Protection, 5:59-66.

Kartodihadjo H, Murtilaksono M, Sudadi U. 2004. Institusi Pengelolaan Daerah Aliran Sungai: Konsep dan Pengantar Analisis Kebijakan. Fakultas Kehutanan Institut Pertanian Bogor. Bogor (ID): Institut Pertanian Bogor.

Kartodihardjo H, Jhamtani H (Editor). 2006. Politik Lingkungan dan Kekuasaan di Indonesia. Jakarta (ID):Equinox.

Kodoatie RJ, Sjarief R. 2010. Water Spatial Arrangement. Yogyakarta (ID): Andi.

Mostert E. 2006. Integrated Water Resources Management in The Netherlands: How Concepts FunctionJournal of Contemporary Water Research & Education 135: 19-27

Ngwira A, Johnsen FH, Aune JB, Mekuria M, Thierfelder C. 2014. Adoption and extent of conservation agriculture practices among smallholder farmers in Malawi. Journal Of Soil And Water Conservation, Vol 69(2): 107-119

North DC. 1990. Institutions, Institutional Changes and Economic Performance. London (GB): Cambridgs University Press.

North DC. 1991. Institutions. *The Journal of Economic Perspectives* 5 (1):97-112.

Oii CS, Ek R. 2010. Culture, Work and Emotion. *Culture Unbound: Journal of Current Culture Research* 2:303-310.

Oorthuizen J. 2003. Water, works and wages: The everyday politics of irrigation management reform in the Philippines Wageningen University Water Resources Series. Orient Longman. New Delhi.

Ostrom E. 1990. Govering the Commons: The Evolution of Institutions for Collective Action. Cambridge (GB): Cambridge University.

Prasad N. 2007. Privatisation Of Water: A Historical Perspective. Law, Environment and Development Journal Vol 3(2):217-233

Prawiranegara M. 2014. Spatial Multi-Criteria Analysis (SMCA) for Basin-Wide Flood Risk Assessment as a Tool for Improving Spatial Planning and Urban Resilience Policy Making: A Case Study of Marikina River Basin, Metro Manila-Philippines. *Proedia-Social and Behavioral Science* 135:18-24

Qiting Z, Junzia MA, Jie Tao. 2013. Chinese Water Resource Management and Application of the Harmony Theory. Journal of Resources and Ecology 4(2):165-171.

Rustiadi E, Saefulhakim S,Panuju DR. 2011. Regional and development Planning. Bogor (ID):Indopress.

Sudarmalik, Kartodiharjo H, Soedomo S, Adiwibowo S. 2014. The State and Development of Industrial Plantation Forest. *Jurnal Manajemen Hutan Tropika* 20(3):150-158.

[UN] The United Nations. 2012. The Future We Want. www.un.org/**futurewewant.**

[WCED] The Word Commission on Environment and Development. 1987. Our Common Future. UK:Oxford University.

Williamson OE. 1975. Markets and Hierarchies: Analysis and Antitrust Implications. *Organizational Forms and Internal Efficiency* 63(2):316-326

Williamson OE. 2000. The New Institutional Economics: Tacking Stock, Looking Ahead.*Journal of Economic Literature* 38:595-613

W. Richard Scott. 2001. *Institutions and Organizations, Second Edition.* Sage publications, Inc. California.

Yu X, Geng Y, Heck P, Xue B. A Review of China's Rural Water Management. Sustainability, Vol 7: 5773-5792