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Effectiveness of Management Strategies Employed in Taguibo River Watershed Forest Reserve for Water Supply in Butuan City, Philippines

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A B S T R A C T

Despite the existence of a management council governing Taguibo River Watershed Forest Reserve (TRWFR), the TRWFR is facing threats due to residential, commercial and road development, and geologic hazards. No study has been conducted to evaluate the implemented strategies in the site. This study is undertaken to assessed TRWFR using Management Effectiveness Tracking Tool (METT). Key informant interview (KII) was conducted, and secondary information was used. The METT score for TRWFR management effectiveness was low (39.59%). The input and output management component had 14.40% and 13.33% scores, respectively, which suggest very few to practically no support for effective operational/logistical needs. However, the context component has the highest score (66.67%) due to Presidential Proclamation No. 1076, which is very important in the protected area (PA) management. The results suggest that there should be enhanced support in terms of management strategies for the effective management of PA.

Keywords: *management effectiveness tracking tool, Taguibo River*

1 Introduction

Forest and water in the watershed area are considered common property resources that must be owned and governed by some collective institution, whether it be the state, a corporation, or a self-organized, horizontal association of the user (Ostrom, 2013). In the Philippines, the environmental conservation framework is community-focused, where decision-making is participatory and multi-sectoral (PAWB-DENR-ASoG-UNDP, 2012). The Republic Act 7586, otherwise known as the National Integrated Protected Areas System (NIPAS) Act of 1992, provides a legal framework for the management of protected areas in the country. However, despite the significant gains in protected areas management, the country is still losing its remaining forest and coastal ecosystem at an alarming rate (Dizon, 2012).

The watershed management problems are usually quite diverse and involve a wide range of biological, geological, chemical, and physical processes with complex human, social, and economic contexts (Milne, Lund & Scheierling, 2010). As suggested by Holling (1973), natural systems (even in the absence of human disturbance) are often in transient states rather than in a single equilibrium condition. On the other hand, Cruz (2014) pointed out that the fundamental causes of watershed degradation lie in watershed managers' weak governance. Such weak governance is reflected in poor planning and execution of land use and management plans; multiple and overlapping government agencies involved in watershed management; ineffective policies, enforcement, and monitoring; lack of capable actors and players; absence of adequate information;

and undervaluation of watershed resources (Cruz, 2014).

A study of water balance shows that 17 of the 20 major river basins in the Philippines will experience water shortages until 2025. This scenario is projected to happen with high economic growth and on the assumption that there is no water resource development program (JICA/NWRB, 1998). Greenpeace's (2007) news article reported that in the summer of 2007, cases of water supply problems in the Visayas because of the drying up of water resources. The same cited article reports that in Iloilo, the water district has started rationing water supply to consumers because of the expected increase in demand and the low water level of its source.

In Butuan City, the Taguibo River Watershed Forest Reserve (TRWFR) was proclaimed a protected area for the protection, maintenance, and improvement of water yield for utilization of domestic and irrigation supply. The Taguibo River is the primary source of potable water supply distributed by the Butuan City Water District (BCWD) to more than 500,000 households and business establishments. It is also the source of irrigation facilities in the city. TRWFR is managed collectively by local stakeholders such as BCWD, DENR, and Local Government Unit of Butuan City. This study assessed the effectiveness of management strategies of TRWFR to address possible management gaps for local water supply improvement.

2 Materials and Method

Location of the Study

The study focused on Taguibo River Watershed Forest Reserve (TRWFR), which is part of the Taguibo Watershed (Figure 1). Taguibo Watershed is located in Butuan City and municipalities of R.T. Romualdez, Cabadbaran, and Magallanes, Agusan del Norte, and a portion of Sibagat, Agusan del Sur. It lies between the coordinates 8º58'00" to 9º05'35" north latitude and 125º31'00" to 125º43'16" east longitude with an entire area of 12,438 hectares in which 4,367.44 of its hectares are proclaimed as TRWFR. The TRWFR was proclaimed on September 4, 1997, under Presidential Proclamation No. 1076 for protection, maintenance, and improvement of water yield. It is also covered under House Bill No. 4852, otherwise known as "An Act Declaring the Mt. Hilong-hilong Range as a protected areas and other purposes" situated in the cities of Butuan and Cabadbaran and the Municipalities of RT Romualdez and Santiago.

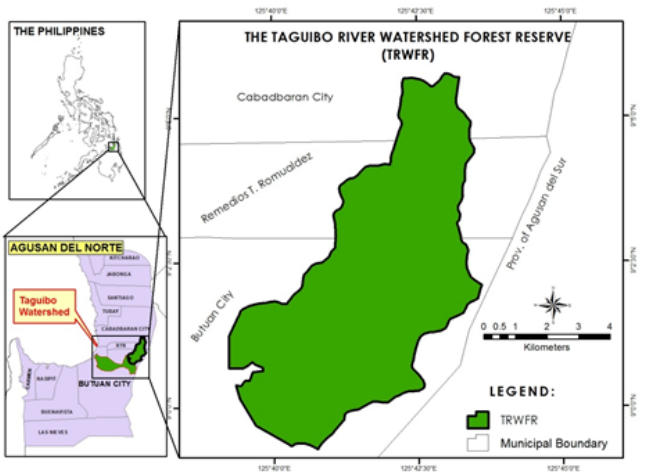

Figure 1. Location Map of Taguibo River Watershed Forest Reserve (TRWFR) in Agusan del Norte, Philippines

Management Effectiveness Assessment of TRWF

Management Effectiveness Tracking Tool (METT) is one of the most widely used globally applicable generic systems developed to assess protected area management effectiveness (WWF International, 2007). The METT was used to evaluate the strength and weaknesses of TRWFR management and the threats it is facing. The tool employs rapid assessment based on the scorecard questionnaire, which includes all six elements of management identified in the World Commission on Protected Areas (WCPA) Framework – the context, planning, inputs, process, outcomes, and outputs. The questionnaire provides a generic list of threats that protected areas can face in which the assessors are asked to identify and rank their impact on the protected area. Ranks are classified as "high" , which refers to those threats with seriously degrading values

(>10% to 100%); "medium" which are those threats having some negative impact (>5% to 10%); and "low" which refer to threats that are present but not seriously impacting values (<5% to >0%). Also, the respondent can answer "not applicable (N/A)" if the threat is not present or not applicable in the area and "no data" if there is no available information to rank the threats.

On the other hand, the assessment form is structured around 30 questions. A series of four alternative answers are provided against each item to help respondents make a judgment as to the level of the score given. Assessment is made by assigning a single rating ranging between 0 (poor) to 3 (excellent).

Primary data was gathered through the conduct of key informant interview using the METT survey questionnaire. Secondary data such as watershed management plan, community based forest management (CBFM) shapefiles and certificate of ancestral domain title (CADT) shapefile were obtained from Department of Environment and Natural Resources (DENR).

A total of 10 respondents are selected based on its active participation in the management of Taguibo Watershed Management Council (TWMC), a body that oversees the management of TRWFR. Also, representatives from the local government unit having jurisdiction in the TRWFR were also considered since they can provide time-series information of the watershed ecosystem health status. Respondents comprise of representative(s) coming from DENR, BCWD, CENRO-Butuan, LGU-Butuan (City ENRO), Father Saturnino Urios University (FSUU), Barangay Captain of Anticala, Butuan City and Barangay San Antonio, RTR, Agusan del Norte. The gathered data were then analyzed using descriptive statistics.

3 Results and Discussion

Key Issues and Threats

Table 1 presents the result of threat values based on the METT response of the key informant interview. The highest possible answer in threat values is 10 representing a total of 10 respondents. However, values can also have a total of <10 since some respondents answered "no data" or "non-applicable" which were not accounted.

Table 1. Issues and threats ranked through METT in TRWFR, Agusan del Norte, Philippines.

TRWFR Threats	MEAN THREAT VALUES		
	High	Medium	Low
Residential and commercial development	5	1	4
Agriculture	1.67	4	3
Mining	3	4	2
Transportation corridor	7	2	1
Biological resource use and harm	4	2	3.67
Human intrusion and disturbance	1.5	2	5
Natural system modification	3.33	2	4
Invasive and other problematic species and genes	1	0.50	1.75
Pollution entering or generated	2	3	4.33
Geological event	6	3	1
Climate change and severe weather	3.5	3	2.75
Specific cultural and social threats	2	3	5
TOTAL	40.0	29.5	37.5

Generally, the respondents perceived that the protected area (PA) is facing a high level of threats. Among the major threats identified were residential and commercial development, transportation corridor, and

geologic events. Human settlements in the area are said to have increased due to an unregulated population influx in the area. Also, the construction of national roads and provisions of utility and service lines (e.g. electricity and cellphone signal) attracts accessibility towards the area. Likewise, landslide, erosion, and siltation were also observed, probably attributed to illegal activities in upstream areas such as small-scale mining, road construction, and timber poaching documented on the year 2005-2009. At present, agricultural activities are seen to primarily contribute to erosion which has a medium values (Table 1). Respondents also observed the impacts brought by climate change such as high reductions of water level in Taguibo River during months with low precipitation, usually in April, May, July, and August increasing ambient temperature in the area. Nevertheless, this can be a result of compounded impacts from sedimentation that reduces the water storage capacity of tributary system and fragmentation of forest cover reducing heat absorption potential.

Management Effectiveness Assessment Score

The METT score results showed a generally low rating. Context and outcome possess the highest ratings of above 50% since the PA has been established through Presidential Proclamation No. 1076, s. 1997. The budget of regular operations in the PA is not secured since NIPAS does not yet cover it, and it only depends on the budget allocated by different stakeholders like DENR, BCWD, City LGU, FSUU etc. on per project basis. This was supported by a low scoring of inputs and outputs. Table 2 shows the trend among the management components

Table 2. Summary of METT scores derived from Key Informant Interview

Management Component Scored/ Assessed	Maximum Total Points Possible	Expert Score	% Score
Context	3	2.00	66.67
Planning	26	11.40	43.85
Inputs	25	3.60	14.40
Process	39	16.20	41.54
Outputs	3	0.40	13.33
Outcomes	9	5.20	57.78
TOTAL	105	38.8	39.59*

*total average in terms of percentage

Context. The TRWFR was declared as a reserve area for protection, maintenance, and improvement of its water yield and providing a restraining mechanism for inappropriate forest exploitation and land-use practices by virtue of Proclamation No. 1076, s. 1997 which was issued by President Fidel V. Ramos on September 4, 1997. The administrative jurisdiction, supervision, and control of the reservation of the area was placed under the DENR, in coordination with BCWD and other agencies in maintaining its usefulness as a source of water for both domestic use and irrigation, and other forestry purposes.

Unlike other protected areas, TRWFR is not under the National Integrated Protected Area System (NIPAS) Law. Thus, it is not covered by Protected Area and Wildlife Bureau (PAWB) and has no Protected Area Supervisor (PASu). According to the mandate of Proclamation No. 1076, multi-stakeholder Taguibo Watershed Management Council (TWMC) was created to lead towards attaining the PA objectives.

A portion of TRWFR is covered by Community Based Forest Resource Agreement (CBFMA) and Certificate of Ancestral Domain Title (CADT) No. R-13-BUT-0909-135 was issued on September 23, 2009 by then NCIP Chairperson Atty. Eugenio Ensigne. Moreover, the Butuan City Sanguniang Panglungsod has approved SP Ordinance No. 3982-2012, "An Ordinance Addressing the Protection, Conservation, Rehabilitation and Management of the Watersheds within the Jurisdiction of Butuan City, Creating the Watershed Management Council therefore, and for other purpose" which is referred as the "Watershed Code of Butuan City" on August 6, 2012. The ordinance primarily aims to implement a comprehensive program

that would protect, preserve, rehabilitate, and rationally manage all the identified and soon to be identified watersheds in Butuan City. Additionally, DENR Administrative Order No. 2012-11 is issued on December 28, 2012 designating Taguibo River as a Water Quality Management Area (WQMA) to primarily protect and improve its water quality.

Planning. The TWMC has drafted Implementing Rules and Regulations (IRR) known as TWMC Resolution No. 1, series of 2012 that defines the functions and responsibilities of the council and the indigenous people (IP) occupying the ancestral land at the watershed.

It was found that different management plans exist and need integration and harmonization. These plans are the Taguibo Integrated Watershed Management Plan of 2010 by DENR and BCWD, the Watershed Development Plan by Butuan City, and the Ancestral Domain Sustainable Development Protection Plan (ADSPP) which has an overlapping and some contradicting objectives. With the issue, the TWMC is on its process of consultative planning for harmonization of these plans to ensure that programs and projects implemented within the watershed area conformed to the right of IP's and coherent to the existing environmental policies.

At present, the TWMC monitors the environmental commitment of DPWH with regards to the national road project that traverses the watershed, and the construction of Bulk-Water Project by Taguibo Aquatech Solutions Corporation (TASC) to ensure that possible issues will be incorporated in the plan. A move to update, harmonize, and integrate the management plans for TRWFR is now being called up to the council since the last integrated management plan was on the year 2010. Though Butuan City has an existing Forest Land Use Plan (FLUP) for the forestland under its administrative jurisdiction, a specific FLUP for TRWFR is still on the process of an organization by the council.

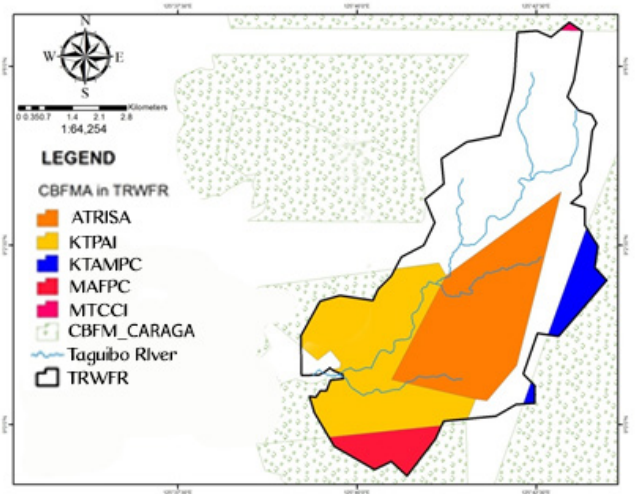

Figure 2. Community Based Forest Resource Management Agreement (CBFMA)in TRWFR. *Source: DENR CBFM Shapefiles, 2013*

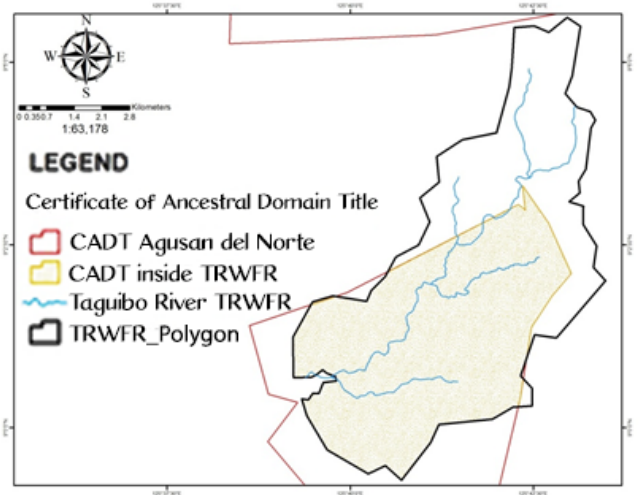

Figure 3. Certificate of Ancestral Domain Title (CADT) in TRWFR
Source: DENR CADT Agusan del Norte Shapefiles, 2013

Inputs. The establishment of permanent PASu and staff is absent in the management of the protected area. Instead, TWMC is created to deliver the mandate of protection and management of the watershed area. Generally, TRWFR has low inputs, as seen in the absence of permanent staff (both technical and forest guards) and patrol equipment and other equipment support for the protection and surveillance work in the area. The sources of funds of the TRWFR are the budget from different stakeholders depending on their project allocation

like the National Greening Program (NGP) of DENR; reforestation and livelihood project of BCWD; outreach programs of FSUU; and projects from environmental commitments of DPWH and TASC like tree planting, etc. Apart from the budget, there are no other sources of income since ecotourism is not yet developed in the area, which could generate funds out from entrance fees.

Currently, there is no updated resource inventory of flora and fauna within the TRWFR, which has its last inventory in 2009 by LEAF Foundation Incorporated (Ruiz pers. comm). Water flow monitoring was not also intensively carried out in spite that the primary watershed objective is to sustain the water supply in Butuan City.

Process. TWMC lacks an effective protection system in controlling access or resource use since portion of the area is covered by Certificate of Ancestral Domain Title (CADT) and Community-Based Forest Management (CBFM). Table 3 and Figure 2 show the list of CBFMA in the area of which around 2,458.63 ha. or 56.29% are within the PA. The CADT covers around 2,773.22 or 63.50% of the PA (Figure 3). More than 50% of the area was given to IPs with the right to utilize the portion of the PA employing conservation and sustainable practices like agroforestry activity. However, population increase puts pressure on the utilization of the area into agriculture. It poses potential for a wider area exposed to habitation and unsustainable activities to support subsistence living such as illegal cutting of trees. Also, some of the land rights of IP members were illegally sold to private individuals. This problem could create conflict with resource use in contrast to CBFM agreement and ADSDPP if a private entity has a self-interest to develop the area.

The lack of comprehensive survey and research work, such as studies to update all flora and fauna within the TRWF, hydrological study, social research, etc. deter in coming up with a comprehensive, holistic, and active management of critical habitats, species, ecological processes, and cultural values. Likewise, the council has no sole budget and just relied on the stakeholder's respective allocation projects. Equipment and facilities in TRWFR for the protection system are also absent.

With regards to education and awareness program, there have been information, education and communication (IEC) programs for both the staff and the stakeholders to be able to teach the importance of the presence and protection of the forest reserve.

Table 3. List of Community Based Forest Resource Agreement in TRWFR

CBFM Name	Peoples Organization Name	CBFM Number	Date Issued	Total Area (ha)	Area within the TRWFR (ha)
KTAMPC	Kolambugan Tribal Association Multi-purpose Coop	74003	5/30/2000	5,125.00	168.35
MAFPC	Macato-Agro Forestry Producers Coop	70008	11/18/1999	2,526.25	200.61
KTPAI	Kabuhay Tree Planters Association, Inc.	70009	11/18/1999	1,282.47	1,083.31
MTCCI	Mahaba Tribal Council of Cultural Communities, Inc.	70005	1/22/1999	3,137.00	6.36
ATRISA	Anticala Tribal Settlers Association	70007	11/15/1999	1,000.00	1,000.00
TOTAL				13,070.72	2,458.63

Outcome. The present management system needs to be improved to protect and conserve the TRWFR's inherent natural resources efficiently. The legal mandate given to DENR, BCWD, and other government agencies has partly not maintained and improved the water yield as indicated by lack of water supply in Butuan City for irrigation purposes during dry months and low domestic water supply during rainy days. This observation is due to high turbidity, which can no longer be treated by BCWD treatment facility. The NGP and reforestation or tree planting projects of other stakeholders are taken into priority to rehabilitate the ecosystem. The IPs has gained economic benefits from contract service given by particular plans and potential economic benefits from fruit trees planted. However, projects do not promise sustainability with the

threat pose by increasing settlements in the PA.

The lack and unsecured annual budget were seen as the main limitation in the management of the TRWFR. An unsecured fund means a lack of protection system and enforcement. Generally, the METT scores (from threats, planning, and output) reflect the present condition of the TRWFR concerning ecosystem quality and policy implementation and enforcement.

Output. The existing Taguibo Integrated Watershed Management Plan consists of four (4) management goals and four (4) main objectives. The goal describes the direct targets of a desirable state of the PA while the objectives give more tangible expressions of how the goals can be attained. The objectives of the management plan are to conserve, protect and rehabilitate the watershed area; to increase level of awareness and participation of stakeholders on the development and implementation of environmental laws, rules and regulations; to formulate mechanism for effective implementation of different plans and programs; and to develop appropriate and sustainable livelihood opportunities. The goals for the PA are primarily to sustain the supply of quality and quantity of water for drinking, irrigation, and other industrial uses; conservation; promote equitable access to opportunities and benefits derive from watershed services, and respect IP customs and traditions and practices.

The output of the PA seemed to be unacceptable using the METT instrument because it has a 13.33 % score. This result is supported by the absence of visitor facilities, although, BCWD has its multipurpose-hall used in holding meetings with the project cooperators. However, the parameter to measure output in the management of TRWF using METT seemed not enough as it only has one parameter measuring the presence of a visitor facility.

4 Conclusion

The TRWFR is seriously degrading, as implicated by the result of issues and threats present in the area. Siltation of the river reduced the water holding capacity that resulted in low water supply for irrigation during months with less rainfall since most of the water are utilized for domestic supply.

The TWMC management effectiveness of TRWFR is low. The context component has the highest score due to the presidential proclamation of TRWFR as a protected area. The environmental-related programs (e.g. reforestation, livelihood, and IEC's) have moderate outcome score. The process and planning components also had low rating. This result is consistent with the response of key informants to the ongoing management activities in the TRWFR. DENR (PENRO and CENRO) and BCWD are mainly responsible for the implementation of the watershed plan. The low input and output rating is consistent with the very low to practically no operational/logistical support for the management of the TRWFR.

The institutional capability of TWMC should be improved to ensure the protection of its water yield to meet the domestic water supply and irrigation needs of Butuan City. Payment for ecosystem services (PES) should be instituted for the rehabilitation, protection, and development of TRWFR.

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Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

6 References

Cruz, R. O. (2014). Strategies for Attaining Sustainability and Resilience in Watershed. *SEARCA Policy Brief Series 2014*-3. ISSN 1656-8818.

Cruz, R. O. (2014). Watershed in a Changing Climate: Issues and Challenges. *SEARCA Policy Brief Series 2014*-2. ISSN 1656-8818.

Dizon, N. (2012). DENR report admits Philippines is way behind biodiversity protection.Philippine Daily Inquirer. http://newsinfo.inquirer.net/283192/denr-report-admits-philippines-is-way-behind-biodiversity-protection

Greenpeace. (2007). *The state of water resources in the Philippines.* 24 K-J corner K-7 Streets, East Kamias, Quezon City, Philippines: Greenpeace Southeast Asia.

Holling, C. S. (1973). Resilience and Stability of Ecological Systems. *Annual Review of Ecology and Systematics,4,* 1-23.

JICA/NWRB. (1998). *Master plan study on water resources management in the Republic of the Philippines: Final Report.* Nippon Koei Co. Ltd., Tokyo, Japan/Nippon JogesuidoSekkei Co., Ltd.: Tokyo, Japan.

Milne, G., Lund, J. R., & Scheierling, S. M. (2010). *Modeling for watershed management : a practitioner's guide* (No. 55572) (pp. 1–34).The World Bank. Retrieved from http://documents.worldbank.org/curated/en/2010/06/12525138/modeling-watershed-management-practitioners-guide.

Ostrom, E. (2013). Governing the Commons: The evolution of Institutions for Collective Action.www.resilience.org/print/2013-11-01/governing-the-commons-by-elinor-ostrom-review

PAWB-DENR-ASoG-UNDP. (2012). Communities in nature: state of protected areas management in the Philippines. www.pawb.gov.ph

WWF INTERNATIONAL (2007). Management Effectiveness Tracking Tool Reporting Progress at Protected Area Sites: Second Edition.ISBN: 978-2-88085-281-8