CURRENT ISSUE

Volume 6 Number 2: December 2017

Date of Publication 15 December 2017

ASIAN JOURNAL OF CONSERVATION BIOLOGY

Vol. 6, Number 2   December, 2017

Turtle Conservation & Research Programme (TCRP)

Asian Journal of Conservation Biology

Table of Contents: Volume 6 Number 2: December 2017

[ABSTRACT]   [FULL PAPER PDF]

Short Communication

The diversity of tortoises and their diet at Tswapong North District of Botswana
Setlalekgomo M.R., Gaoganetswe M., Selebatso T.

[DOWNLOAD PDF]

On the taxonomy and nomenclature of common Indian cricket frog *Rana agricola* Jerdon, 1853 (Amphibia: Dicroglossidae)
S. R. Ganesh, Sushil K. Dutta, S. R. Chandramouli

[DOWNLOAD PDF]

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Frequency: Bi-annual [July & December]

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International Scientific Indexing (ISI) Impact Factor:2013: 1.512;**2014:** 2.189, **Index Copernicus Value (ICV): 2012:** 6.13; **2013:** 6.13; **2014:** 83.73, **Journal Quality Indicator of India (JQII) Score: 0.551,** **GIF: 2012:** 0.453 ; **2013:** 0.555; **2014:** 0.665; **2015:** 0.765

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A study of strategic plan for Forest Stand Conservation in the Nature Reserve of Taliabu Island

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ABSTRACT

Presently it perceived is increasingly difficult for the management of a nature reserve and other conservation areas because in general the area of forest is increasingly narrow in almost all countries in the world both developed and developing countries. One of the causes is the explosion of people in the world that has been pushing for greater infrastructure development in all countries such as for road construction and water installations, settlements, government and private offices, business or market centers, agriculture and livestock, opening of mining activities in the forest area, etc. This is further exacerbated by the rampant illegal logging activities in forest areas. This paper aims to develop the management strategy of Nature Reserve at Taliabu Island with SWOT, QSPM and the projection of the first and second 5 year activities. The GIS Management is also carried out with the help of GIS. Base on the results of research conducted it can be known priority strategy is determined by ranking the strategies based on the value of the TAS from the largest to the smallest. In addition, 3 zones of Taliabu Island Nature Reserve management are defined as: core zone, buffer zone and transition zone.

Keywords: SWOT, QSPM, TAS, nature preserve, natural resources, conflict resolution

INTRODUCTION

The Nature preserve is a nature reserve area that has specific characteristics of plants and ecosystems that must be protected and preserved. The sustainability of a nature reserve should run naturally in accordance with its original condition. In addition, the flora and fauna contained in it can be used for purposes in the present and future. Characteristics in the determination of a nature reserve area include: having a diversity of plants and ecosystems; The representation of formation from certain biota and its constituent units; Have rare plant communities and ecosystems or their near-extinct existence; Has a characteristic potential so that it becomes an example for the existence of an ecosystem that requires conservation and protection efforts; Lies in forest areas that have not been disturbed by human intervention to a sufficient extent to support the management of the nature reserve and ensure natural ecological sustainability; etc.

Presently it increasingly is difficult for the management of a nature reserve and other conservation areas because in general the area of forest is increasingly narrow in almost all countries in the world both developed and developing countries. Therefore, there are more and more disturbances and threats to the forest area both in production forests, protected forests and other forest conservation areas. One of the causes is the explosion of people in the world which has been

pushing for greater infrastructure development in all countries such as for road construction and water installations, settlements, government and private offices, business or market centers, agriculture and livestock, mining opening activities in forest area etc. This is further exacerbated by the rampant illegal logging activities.

Kleinschmit *et al.* (2016), illegal logging has recently been recognized as a form of transnational organized crime that has increased support for integrated international interventions. The evidence shows that there is a very different kind of actor's involvement, with overlapping and collusion between some parties such as legal and illegal entrepreneurs, corporations, "traditional" criminals, as well as state actors and agents. In some parts of the world, organized forest crime may be very cruel and also linked to the financing of war and conflict. Related to infrastructure development, Otto & Ozment (2017) reminded of the development priority of natural infrastructure such as forest rather than artificial infrastructure. So don't sacrifice too much forest area for the development of artificial infrastructure. They argue that the natural system also has unique benefits that make them immune to some of the problems faced in infrastructure development, for example in America. Considerations are given: (1) the value of forest appreciated over time as it grows and develops - unlike built infrastructure, such as pipes and reservoirs, which ultimately require costly repairs or complete replacement; (2) the forest

provides benefits other than supplying clean water, such as carbon sequestration, habitat provision and recreational opportunities; and (3) forests and wetlands build resilience to infrastructure systems built around them by absorbing flood waters and providing a buffer against storm surges. This extends the lifespan of built systems and increases their capacity to cope with extreme climate and weather changes. The consequences of deforestation and forest degradation around the world have triggered climate change. The impact of global warming has caused a natural disaster that is felt from time to time is increasingly large and frequent. Of course this has caused a lot of worries of the world's population. Faced with these conditions, in the management of a nature reserve and conservation area will not be separated from the conflict of interest in the management of natural resources. So, on the one hand there are efforts to protect and conserve the area and on the other side for utilization in the development of the economy to improve the welfare of the population. Thus, in general can be said that where there are natural resources there is a conflict of interest.

According to the EU-UN Partnership (2008a), conflict management related to natural resources is now more important than ever. With increasing economic growth and world population has also increased the level of global consumption; various countries face various problems such as lack of important renewable resources such as fresh water, agricultural land, rangeland, forests, fisheries and other wildlife. The occurrence of environmental degradation and climate change accompanied by the depletion of renewable natural resources has become a fundamental threat to human safety. It can disrupt the livelihoods of the people and negatively impact the ecosystem and undermine peace and development. Therefore, governments, especially in developing countries, are under pressure to be able to manage natural resources sustainably and also resolve conflicts around their ownership, management, allocation and control. Such conflicts can occur non-violently or violently. Furthermore, natural resource conflicts such as land conflicts are usually violent when associated with political exclusion, marginalization and social discrimination processes and the perception that peaceful action is no longer a viable strategy for change. This land conflict can trigger violence because it is closely related to community identity, history and culture. In fact, violent conflict may coexist with peacemaking efforts and may even contribute to the creation of new complaints after a peace deal. To address these violent conflicts requires international support in flexible land conflict managers. In the context of this conflict, for example, conflict management strategies must be complemented by conflict prevention strategies, country development and strategies still ongoing (EU-UN Partnership, 2008b).

There are at least three triggers in natural resource conflict: competition for increasingly scarce renewable resources; Poor natural resource and environmental governance and the dynamics and stresses of cross-border natural resources. There are three major causes of increasing scarcity of resources working separately or in combination: Demand caused by scarcity as

demand arises when certain renewable resource demand cannot be satisfied by the existing supply; Scarcity caused by supply occurs when there is environmental degradation, pollution, natural variation or damage to infrastructure in the delivery or reduction of supply and the presence of "structural scarcity" that occurs when different groups in society face unequal access to resources. This Structural Scarcity can be caused by poor natural resource governance (EU-UN Partnership, 2008a).

In many countries, there are some conflicts that arise in the management of conservation areas in the field. Some examples are given: severe conflicts between reserve managers and local communities in the Nangun River reserve, Yunnan, China (Kui, 2000) or problems in protecting the Khao Yai National Park, Thailand, due to rapid population growth, timber exploitation, Land and energy, tourism and housing development (Panusittikorn & Prato, 2001). Also the threats in the Van Long Nature Reserve are forest fire, unsustainable land use in the core zone of the nature reserve, the rapid development of tourism and the cement plant next to the nature reserve area (Nguyen, 2008). The conflict is also found in the preservation of elephant and or tiger habitat in India and Nepal. Thus, humans and wild animals are forced to share common resources, which can lead to conflicts between humans and wildlife (Bargali, 2016 and Neupane *et al.*, 2017). The conflict also occurred between humans and rare tiger in Kerinci Seblat National Park, Sumatra, Indonesia (Nugraha & Sugardjito, 2009). According to Madden (2009), human-wildlife conflict is a serious obstacle to conservation worldwide and will become more common with increasing human populations, development expands, global climate change, and human and environmental factors that make direct competition between humans and wildlife higher. Beside that, the human-wildlife conflict is a widespread problem and further threatens both animals and local livelihoods. There is an added risk of human life that will further exacerbate the problem if the conflict involves predators (Miranda *et al.*, 2016). The conflict, according to TII (2016), has been exacerbated by the slow response of park management to rapid social and political dynamics beyond national park boundaries, including: (1) lack of clarity on the extent to which communities are involved in park management, (2) during the implementation of decentralization that led to the mutual disagreement between district managers and park managers and (3) the failure of park management to show the real economic contribution to conserve nature in order to support the livelihood of communities and increase the gross domestic product of local governments. The most visible impact of the conflict is the increasing threat of biodiversity. Under the USAID (2015) statement, the main drivers of loss of biodiversity are at least 5 things, namely (1) habitat conversion (e.g., conversion of natural forests to plantations or agriculture); (2) overexploitation of natural resources (e.g., overfishing); (3) pollution (e.g., excessive nutrient loads in freshwater systems); (4) invasive alien species (in nearly all ecosystem types); and (5) the myriad impacts of climate change. Frank (2015) provides a statement related to obstacles in the management of wildlife conservation. The
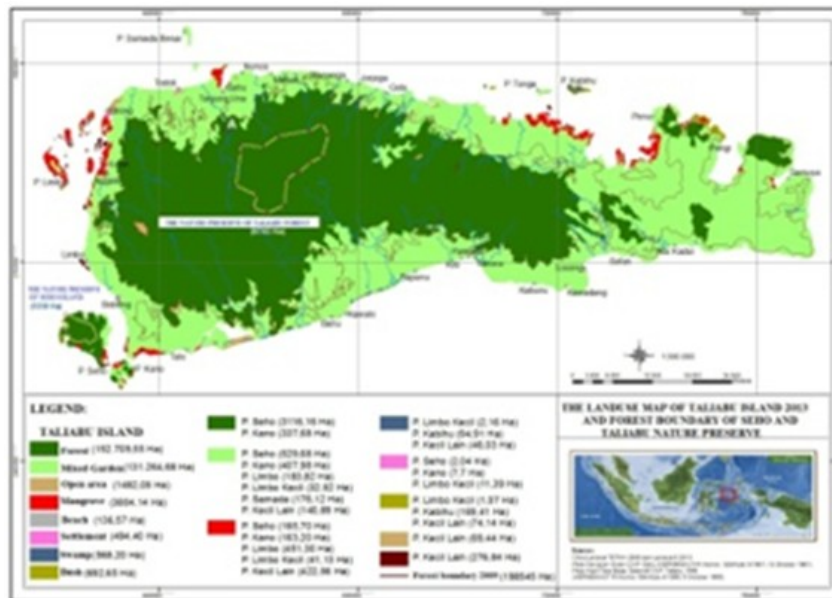
Figure 1. Land-use and study site of Taliabu Island

emergence of these constraints is because practitioners focus their attention on reducing negative interactions, rather than on improving the positive relationship between humans and wildlife. Therefore, the solution to the management of wildlife conservation can be successful that is necessary to do a positive interaction, coexistence, and tolerance toward wildlife. In fact, this is not easy to implement in the field especially for developing countries.

In fact, many conflicts in renewable resources or especially in conservation areas from time to time in each country cannot be solved completely. In general, it can only be solved partially and there is no holistic conflict resolution. Thus, it is imperative that we make many efforts to reduce conflict management in conservation areas or minimize it gradually. Many approaches and techniques for dealing with conflict resolution have been done, one of which is the application of strategic planning. According to Mittenthal (2002), the strategic plan is a tool that provides guidance on mission fulfillment with efficiency and maximum impact. If effective and useful, it should articulate specific objectives and describe the action steps and resources needed to achieve them. As a rule, most of the strategic plans should be reviewed and changed every three to five years. The strategic plan is a comprehensive document covering all aspects of the organization's work, including programs and services, management and operations, fundraising and finance, facilities and governance. Depending on the scope and emphasis of the organization, a plan can also explain approaches to improve marketing, Membership development and administrative systems.

MATERIALS AND METHOD

The study was conducted at Taliabu Island Nature Reserve (TINR) located in Sula Island, west Taliabu District, Taliabu Regency, North Maluku Province. Located is not far from Seho Island Nature Reserve. The Nature Reserve is determined by Decree of the Minister of Forestry Number 648/Kpts-II/1987 with an area of 9,743 Ha. Taliabu Island is specifically located in the Wallace region and between the Wallace line and Webber line that has a wealth of high biodiversity. Therefore, this area needs to be protected and kept in an unspoiled condition for the sake of sources of germ-plasma, innovation, science, technology development to support the world's life order. Land-use and study site is presented in Figure 1.

The management of a reserve area is implemented based on a management plan prepared based on the study of ecological, technical, economic and socio-cultural aspects. Therefore, the preparation of the Ten Year Management Plan of TINR is also based on that aspect by taking into account the factual situation, condition and problems. Further information, data and problems are analyzed taking into consideration national development policies, regional, regional strategic environment and management organization. The management plan of the Nature Reserve is analyzed with SWOT analysis, by identifying external factors (opportunities and threats) and internal factors (strengths and weaknesses). By using the internal and external matrix, it can be given weight and rating on the parameters that have been determined, so that will get the value (score). This value will provide direction on future prospects for the management plan of the Nature Reserve. Determination The priority of the strategy to be implemented is done by evaluating alternative choice strategy with Quantitative Strategies Planning Matrix (QSPM) approach. This stage is done with the aim to determine which strategy is considered the best to be implemented. QSPM is a technique that can be considered as a prioritized rank alternative strategy (David, 2006). The analysis was also conducted by Khaleh *et al*. (2016) to evaluate the status of the tourism industry in Zanjan Province, Iran; Pazouki *et al*. (2017) to determine sustainability indicators and create future urban environmental development models for District 22 of Tehran, Iran and Wati *et al*. (2016) to describe the ecotourism development strategy in order to compete with conventional travel and improve

community welfare in the Forest Conservation and Ecotourism Mangrove Resort Beejay Bakau, Indonesia, etc.

The process of determining the classification of protected nature management areas is done by application of the Geographical Information System (GIS) assisted by Arc Gis Ver. 10.1. And ground check to the field. Various digital maps processed with GIS are: Seho Island Nature Reserve map, definitive boundary map of TINR, base map of thematic forestry of North Maluku Province, Shuttle Radar Topographic Mission (SRTM) data of Taliabu island and imagery of Landsat 7 ETM + Year 2009 and Landsat 8 year 2013. Basic criteria for determining the classification of natural reserve management areas are: altitude, land cover, slope and soil type. Several processes carried out to get the boundary maps, topographic and slope, and land cover of TINR as follows: (1) the initial step in making the boundary maps of TINR was started by making a fill accumulation and then making a flow accumulation. After the calculation of the number of existing flows in the studied area was carried out, the next step was to determine the boundary area in the studied area; (2) the topographic maps were made by using data of SRTM as results of clipping, then the reclassification of terrain height. The altitude determined was classified into five classes, i.e. < 100 m , 100 – 150 m, 150 – 200 m, 200 – 250 m, and > 250 m of above sea level; (3) the making of slopes was started by determining the slopes, and then the re-classing of slopes. The determination of slope class was done for 5 classes, i.e. slope class < 8% (plain), 8 – 15% (slope slightly), 15 – 25% (steep slightly), 25 – 40% (steep), and > 40% (very steep), (4) the mapping of land cover was done based on the results of interpretation on the Landsat 8 satellite images.

RESULTS

Flora and Fauna in Taliabu Island Nature Reserve (TINR)

Biodiversity of TINR is quite high, which is lowland and upland forest vegetation dominated by meranti (*Shorea* spp), palapi (*Heritiera* sp), ironwood (*Intsia bijuga*), samama (*Anthocephalus macrophyllus*), forest nutmeg (*Myristica fatua*), Durian (*Durio zibethinus*), walnut-fruit forest (*Canarium indicum*). There is also a rare type of endemic flora, especially deer-pigs (*Babyrousa babyroussa*), Sula scrubfowl (*Megapodius bernsteinii*), even the deer-pigs species have been declared extinct (Monk, 1997). Other species are white imperial-pigeon (*Ducula luctuosa*), Moluccan hanging-parrot (*Loriculus amabilis*), rusa timorensis (*Cervus timorensis*), Sula cicadabird (*Coracina sula*), east Sulawesi wildlife (*Rhynomyias colonus),* king perling sula (*Basilomis galeatus*), red-backed thrush (*Zoothera erythronota*), Sula barn-owl (*Tyto nigrobrunnea*), rusty-bellied fantail (*Rhipidura teysmanni*) and yellow-and-green loriket (*Trichoglassus flavoviridis Wallace*). For deer-pigs it has been determined that its conservation status is based on Minister of Forestry Regulation Number P.55/Menhut-II/2013 dated 30 October 2013 on Deer-pigs Conservation Strategy and Action Plan of 2013-2022.

This is a framework for the preparation of the Deer-pigs conservation program on Taliabu Island. This is important because until now there is no complete picture of the deer-pigs population in its natural habitat. This type of sustainability poses a serious threat due to reduced and/or habitat destruction as well as to poaching. Deer-pigs is traditionally still often hunted by people around the forest.

The result of determining the management area with GIS application

Management classification areas of TINR uses the GIS application assisted by Arc Gis Ver.10.1 and ground check to the field have been obtained 3 managements zones that include: core zone, buffer zone and transition zone. Determinations of the 3 management zones are: altitude, land cover, slope and soil type. The map of the management zone arrangement is shown in Figure 2.
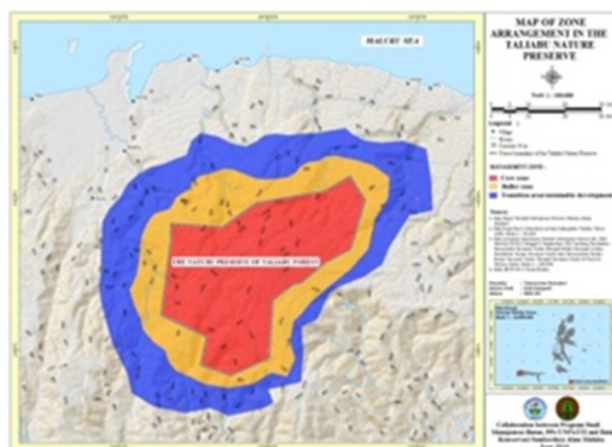

Figure 2. Map of zone arrangement in the TINR

The Result of Internal and External Factors Identification on SWOT Analysis

The result of weighting and scaling of Internal and External factors are presented in Table 1 and 2. The weight of values is expressed by: very unimportant (value 1), unimportant (value 2), quite important (value 3), important (value 4) and very important (value 5), whereas the value scale is very less (value 1), less (value 2), enough (value 3), good (value 4) and excellent (value 5). Then the number of values of each factor is projected into the strategy graph to determine the strategy used.

Based on the results of data processing on the evaluation matrix of internal and external strategic factors, obtained the value of each matrix, which is then incorporated into the quadrant analysis.

Value of Internal Strategic Factor Evaluation Matrix: Total Strength - Total Weakness   3.18 - 2.20 = 0.98

Value of External Strategic Factor External Factor Matrix: Total Opportunity - Total Threat   2.70 - 2.00 = 0.70.

Graph of priority direction strategy TINR is presented in Figure 3.

Table 3. Matrix Level Result *QSPM*

No	Strategies Alternative	TAS
1.	Determination of conservation area management block according to its allocation function.	12,49
2.	Area management development according to the potential of biological resources and its ecosystem.	11,23
3.	Promotion of TINR as a research and education area.	10,08
4.	Improved collaboration between communities and other forestry stakeholders in the management and security of the region.	11,02
5.	Development of local community institutions in the management of the area.	9,63

Table 4. Projected Activity for the First 5-Year Period

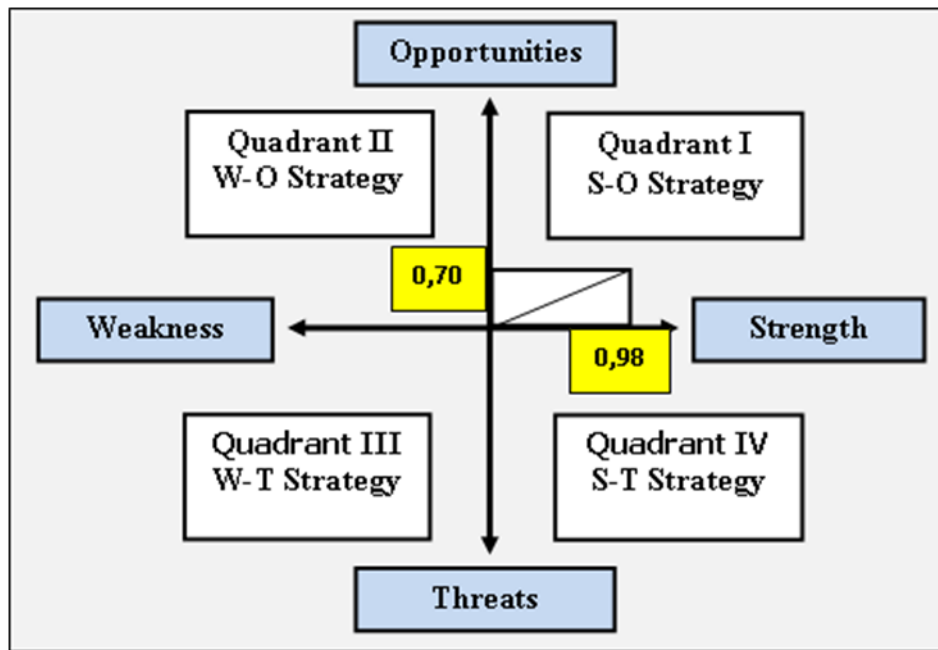| No	Strategies	Activities	Projection
1.	Determination of conservation area management block according to its allocation function.	Inventory and identification of potential areas of TINR. Boundary setting and establishment of management block.	Community access to the area will be limited.
2.	Development of area management according to the potential of biological resources and its ecosystem.	a. Inventory of ecological, economic and social potential of the community. b. Management of area potential. c. Protection and security of the area.	Comprehensive and holistic achieved of area management.
3.	Improved collaboration between communities and other forestry stakeholders in the management and security of the region.	Socializing the role of local communities in the preparation of regional management plans. Strengthening resource capacity of area managers.	Community Involvement actively in the protection and security of the region.
4.	Promotion of TINR as a research and education area.	Inventory of potential areas for research and education activities. Management of utilization for research and education purposes.	The spread of data and information TINR.
5.	Local community institutions development in area management.	Coordinate, communicate and integrate in the implementation of regional management activities.	The creation of good coordination, communication and cooperation between community institutions and area managers.

Figure 3. Graph of priority strategy direction TINR

Table 5. Projected Activity for the Second 5-Year Period

No	Strategies	Activities	Projection
1.	Determination of conservation area management block according to its allocation function.	Maintenance of the boundary zone. Reconstruction of the missing / damaged area boundary.	Achieving the sustainability of the function of the region.
2.	Development of area management according to the potential of biological resources and its ecosystem.	Handling of inventory result through data base management system. Development of monitoring system, evaluation and reporting of data. Recovery of damage to flora / fauna or ecosystem with regard to conservation principles.	The achievement of comprehensive and holistic area management. The preservation of biodiversity and its ecosystem.
3.	Improved collaboration between communities and other forestry stakeholders in the management and security of the region.	Socializing the role of local communities in the preparation of regional management plans. Strengthening resource capacity of area managers.	The community involvement actively in the protection and security of the region.
4.	Promotion of TINR area as a research and education area.	Development of regional promotion through web and other multimedia.	The spread of data and information TINR.
5.	Local community institutions Development in area management.	Coordinate, communicate and integrate in the implementation of regional management activities.	The creation of good coordination, communication and cooperation between community institutions and area managers.

DISCUSSION

The TINR has a high biodiversity so that it needs to be managed properly so that the sustainability of the nature reserve can run naturally in accordance with the original habitat condition. One type of animal that needs to be the main concern is the existence of Hog-deer because of intensive hunting from the local community. Therefore, with the determination of the conservation status based on the Minister of Forestry Regulation Number P.55/Menhut-II/2013 on Deer-pigs Conservation Strategy and Action Plan of 2013-2022 needs to be run well so that the animals do not experience extinction. The various activities to be carried out are tailored to the type of management area that has been established with the help of GIS applications. Classifications of the TINR management area uses the GIS application and ground check to the field has obtained 3 management zones that include: core zone, buffer zone and transition zone (Figure 2). With the map facilitate the management in the field because the program activities carried out on each zone is different.

The quadrant analysis results shown in Figure 3 illustrate that the position of the TINR management is in Quadrant I. This position describes the management of the Sanctuary facing various threats, but still has internal strength. The strategy that needs to be developed is to use the power to exploit opportunities so as to overcome the existing weaknesses. Considering that the management of TINR occupies a position in Quadrant I SWOT diagram then alternative strategy used is strategy S-O (Strength and Opportunities). Since the reserve has diversified potential, it needs to be conserved its area and in its management activities must create a strategy using strength to take advantage of opportunities. Some S-O strategies that can be formulated in responding to TINR management need are: (1) determination of conservation area management block according to its allocation function; (2) development of area management according to the potential of biological resources and its ecosystem; (3) promotion of the TINR area as research and education area; (4) increasing community collaboration and other forest stakeholders in the management and security of the area; and (5) development of local community institutions in the management of the area.

In addition to ranking strategies for generating priority lists, there is only one analysis technique in the literature that is designed to determine the relative attractiveness of feasible action alternatives. This technique is QSPM with the advantage that: the set of strategies can be evaluated gradually or together. For example, corporate level can be evaluated first, followed by division level strategy level, and then functional level strategy. There is no limit to the number of strategies that can be evaluated or the number of sets of strategies that can be evaluated at one time using QSPM (David, 2006). Through the calculation results QSPM TINR can be known priority strategy is determined by ranking the strategies based on the value of the TAS from the largest to the smallest. The sequence can be seen in Table 3.

The elaboration of activities tailored to strategic priorities is expected for the achievement of detailed objectives and outcomes to achieve management objectives every five years and ten years.

CONCLUSION

Management of a nature reserve or other conservation area from time to time encounters many conflicts of interest. This is the result of an increasingly narrow forest area because it is used for infrastructure development as well as the declining quality of forests due to illegal logging. In order to minimize the occurrence of future conflicts, a strategic plan for the management of the nature reserve for a period of 5 years and 10 years is required. Preparation of strategic plan is carried out with SWOT,QSPM and projection of first and second year of activity. These activities are also supported by the determination of management zones created with GIS applications.

ACKNOWLEDGEMENTS

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