

Strategy for increasing the participation of masyarakat peduli api in forest fire control

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Abstract. Forest fires have negative impact on ecology, health, and damage economic activities. One of conservation areas facing the threat of forest fire is Gunung Ciremai National Park. This research aims to formulate a strategy to increase the participation of Masyarakat Peduli Api in the effort of forest fire control. This research use quantitative method with SWOT analysis. Expert consisting of representatives from the national park, Ministry of Environment and Forestry, and BPBD Kuningan Regency. An alternative strategy based on SWOT analysis is in quadrant 1 with coordinate point (0,39; 1,23). The position shows that sustainability of national park management through forest fire control can be done with an aggressive strategy. That is maximizing the strength that is owned with its potential as an ecotourism area to increase community motivation to engage in forest fire control activities. Provision of tourism management licenses will create employment opportunities and increase income for the community so it is expected to increase community participation to prevent the occurrence of forest fires rather than forest fire prevention.

1. Introduction

Since 2010 until 2015, 3 years after the establishment of Gunung Ciremai National Park (TNGC), the incidence of forest fires has always been a threat to the management of TNGC. Even according to the United Nations International Strategy for Disaster Reduction [1] fires are considered a potential threat to sustainable development because of their direct effect on ecosystems. In general forest fires can have negative impacts on ecological and environmental degradation such as damage to natural habitats, changes in composition and structure of forest ecosystems [2], and ultimately interfere with the health and economic activities of the community [3].

The occurrence of forest fires occurring each year indicates a need for comprehensive and integrated mitigation efforts in order to mitigate the negative impacts generated [4]. The handling of forest fires focusing on outages and technology has not been able to stop the occurrence of forest fires occurring every year. The large fires are very difficult to extinguish even when using high-tech fire extinguishers [5]. The reality in the field shows the empowerment efforts of forest and land communities based on the socioeconomic and cultural aspects, government institutions and policies also play an important role in the effort to control forest fires [6]. To address forest and peatland fires in Indonesia, community empowerment is needed because around the forest and peatlands there are socio-economic problems [7]. In Africa and Asia, community-based forest fire management strategies have even become solutions to minimize the impact of forest fires [8].



Community involvement in forest fire control efforts has been endeavored by the Balai TNGC by establishing Masyarakat Peduli Api (MPA). As mandated by Minister of Forestry Regulation no. 12/Menhut-II/2009 Concerning Forest Fire Control, the Community for Concerned Fire (MPA) is a community trained to participate voluntarily to assist officers in forest fire control activities. MPA members' status that is voluntary and does not generate direct material benefits, so many MPA members are inactive and that indirectly leads to a decrease in the MPA participation rate in TNGC. The people are encouraged to participate, consider and consider the following conditions[9]:

1. Community members will participate if the issues or activities offered are considered important by them.
2. Activities offered to the community, by every member of the community are perceived to make a real difference to their lives or bring about better change.
3. Whatever form of participation of every member of society should be respected and given high marks.
4. There is an opportunity or opportunity for every member of the community to participate and any form of participation should be supported.
5. The structure and process of activities are not alien to members of society. It means to be compatibility with social, economy and culture of society.

Whereas one indicator of the success of development is the presence or absence of community participation. In forest fire control, community participation can be implemented in the form of the involvement of the activities of the planner, the prevention of forest fires, the prevention of forest fires and post-fire forest handling. An effective and sustainable approach to fire management by involving communities that are the main source of forest fires, and usually the first to bear losses from fire [10]. The results of Mayer's [11] study on community-based fire management in both Kalimantan and California point to the fact that community involvement in fire management is the most promising approach to achieving sustainable forests. In order to achieve this it becomes very important to formulate a strategy of increasing MPA participation in forest fire control efforts.

2. Research methods

2.1. Approach and location of research

This research uses quantitative approach with quantitative method. The research location is in Gunung Ciremai National Park, West Java. Mount Ciremai National Park is one of the conservation forest areas that have high biodiversity, and includes water catchment area for the area below it and some important river in Kuningan, Majalengka and Cirebon regencies as well as source of several springs utilized for community, agriculture, Fisheries, PDAM supply, and industry, and has the potential of ecotourism.

2.2. Analysis technique

This research method consists of literature study, expert determination, data collection and data analysis. The literature study was conducted to obtain all environmental factors both internal and external. The quantitative experts are people who have a role in forest fire control activities in TNGC. The Expert consists of MPA chairman, staff of Balai TNGC, staff of Ministry of Environment and Forestry and employees of Regional Disaster Management Agency (BNPB) of Kuningan Regency. Furthermore, we are given weight and rating on internal and external factors, done by giving questionnaire to expert. Determine the weights for each internal and external factors that range from 0 to 1. Regardless of whether a factor is a strength, a weakness, a threat or an opportunity, a factor that is considered to have the greatest effect of gaining the greatest weight. The total weight of all internal and external factors must be equal to 1.00. Determine rating on internal and external factors. Rating is obtained by calculating the mean of the rating value of each factor of the overall expert. Determination of strengths and weaknesses on internal factors, and opportunities and threats on external factors by criteria:

1) Internal factors

Strenght, if the score is > benchmark value.

Weakness, if the score <benchmark value.

2) External factors

Opportunity, if the score is > benchmark value.

Threat, if the score <benchmark value.

3. Results and discussion

In this study, Balai TNGC is a conservation organization that must always maintain the integrity of ecosystem and biodiversity. So in the face of strategic problems of the organization that forest fires need to formulated a comprehensive strategy, which in the process carried out an analysis of the environment that combines analysis of internal conditions and external conditions that exist. The analysis is a SWOT analysis. The environmental analysis includes an analysis of the external and internal environment [12].

3.1. Identification of internal and external factors

The first step in the preparation of SWOT analysis is to review the internal and external factors of forest fire control. The internal factors studied in this study may consist of human resources as much as possible, such as processes, including strategies, structures, organizational culture, finance, and development, as well as physical resources (geographical location and technology)[13]. The external factors, as far as possible consist of government policies, socio-cultural and economic aspects, environmental physical conditions, and the role of related institutions such as Government, Private, and NGOs [14].

The results of identification of internal and external factors are as follows:

1. The availability of supporting tools of fire fighting activities is still inadequate
2. The TNGC Hall provides an opportunity for MPA to be involved in forest fire control efforts.
3. The motivation of MPA to engage in forest fire control activities is related to the assurance of income
4. Vegetation of constituents of TNGC are vulnerable to forest fires
5. The TNGC Hall does not conduct regular training for the MPA
6. The TNGC office seeks to make new breakthroughs in dealing with forest fires.
7. The availability of funds for fire control activities is not sufficient.
8. The area of TNGC has the potential to be developed as an ecotourism area.
9. The availability of MPA members owned by Balai TNGC is not sufficient.
10. Patrol activities conducted by Balai TNGC and MPA have not been routinely implemented.
11. Membership as a voluntary MPA strongly influences MPA commitments in forest fire control activities.
12. The Fire Care Society has the capability to support forest fire control activities.

The results of identification of external factors conducted through interviews and completed with literature study are as follows:

1. The forest fire management measures still depend on the incidence of forest fires
2. The community has an understanding of the impact of forest fires
3. Motivation to gain benefits (eg income) from the presence of the TNGC area makes the community contribute to preserve forest kelastarian including from the threat of forest fires
4. A comprehensive strategy is needed in dealing with the incidence of forest fires
5. TNGC forest areas have important value for the surrounding community
6. Forest fire management in Indonesia is still implemented sectorally
7. Society to date still rely on the availability of water from the area of TNGC
8. Kuningan Regency declares itself as a Conservation District
9. LHK Candidate No. 32 of 2016 on Forest and Land Fire Control provides opportunities for improved forest fire control

10. The government should formulate the concept of community involvement in forest fire control activities.
11. The communities around TNGC are working in the ecotourism sector
12. People have local wisdom in handling forest fires
13. People have a habit of clearing land by burning.

3.2. Determine the strength factor and weakness in internal factor

Table 1. Determination of strengths and weaknesses on internal factors

No.	Statments	Score	Description
1.	Hall TNGC provides an opportunity for MPA to be fully involved in forest fire control efforts	3,00	S
2.	TNGC area has the potential to be developed as an ecotourism area	3,29	S
3.	Hall TNGC seeks to make a new breakthrough in dealing with the incident of forest fires	2,86	S
4.	Vegetation of constituents of TNGC are vulnerable to forest fires	2,57	W
5.	Membership as a voluntary MPA strongly influences MPA commitments in forest fire control activities	3,14	S
6.	MPA's motivation to engage in forest fire control activities is related to the assurance of income	2,71	S
7.	Patrolling activities are conducted routinely by TNGC Hall and MPA	2,29	W
8.	The availability of MPA members owned by Balai TNGC is not sufficient	2,43	W
9.	The availability of funds for forest fire control activities is inadequate	2,14	W
10.	Training activities (refreshing) for MPA organized by TNGC Hall routinely implemented	2,29	W
11.	The Fire Care Society has the capability to support forest fire control activities	2,86	S
12.	The availability of fire fighting support equipment is not sufficient	2,26	W
Benchmark		2,65	

Based on the above table, the potential TNGC area as an ecotourism area is the greatest strength factor owned by TNGC Hall. The condition of TNGC area which has potential as ecotourism area is a force to improve economic life for the surrounding community. Various jobs are likely to emerge and become a permanent livelihood for the community. The positive impact of the realization of ecotourism management for TNGC is the preservation of TNGC conditions from all forms of damage including forest fires. The management of the ecotourism area will encourage MPA and even the wider community to always take care of the TNGC area because of the community's dependence on the existence of forests. Internal factors that become the most serious weakness factor for TNGC Hall based on the benchmark value is the availability of funds for fire control activities has not been adequate. This indicates that the central government has not fully supported the forest fire control activities in TNGC. Moreover, the budget condition in Balai TNGC often experience savings. The savings made by Balai TNGC are often not done based on the strategic level of activities.

3.3. Determining opportunities and threats on external factors

Table 2. Determination of opportunities and threats on external factors

No	Statments	Score	Description
1	Motivation to get benefits (eg income) from the presence of TNGC area makes the community contribute to maintain the forest kelastarian including from the threat of forest fires	3,5714	O
2	TNGC forest areas have important values and benefits to the surrounding communities	3,2857	O
3	Communities rely on water availability from the TNGC area	3,2857	O
4	Kuningan regency declared itself as Conservation District	3,4286	O
5	Communities have an understanding of the impact of forest fires on the TNGC area	2,7143	T
6	Regulation of the Minister of Environment and Forestry No. 32 of 2016 on Forest and Land Fire Control provides opportunities for improved forest fire control	3,1429	O
7	The people around TNGC are working in the ecotourism sector	2,4286	T
8	The community has local wisdom in handling forest fires	3,2857	O
9	The forest fire management action being carried out still depends on the occurrence of forest fires	2,8571	T
10	People have a habit of clearing land by burning	1,7143	T
11	A comprehensive strategy is needed in dealing with the incidence of forest fires	3,1429	O
12	The government needs to formulate the concept of community involvement in forest fire control activities	3,1429	O
13	Forest fire management is implemented sectorally	2,8571	O
Benchmark		3,01	

External factors that become the greatest opportunity that is owned by TNGC Hall based on the above table is the motivation to get the benefits (eg. income) from the existence of the TNGC area makes the community helped to maintain the forest kelastarian including from the threat of forest fires. Currently, community access to forest areas is limited so that the former needs can be met from the TNGC area now become impossible. Therefore, people hope that TNGC area will be safeguarded in the form of income as a replacement to fulfill the needs that previously obtained from the forest area. For the most serious threat faced by Balai TNGC is the habit of the community to open the land by burning. Until now, clearing land by burning is the easiest and cheapest way. What matters is that the location of the TNGC is very close to the community's land. Therefore, if the land clearing activity by burning is not carried out carefully it will very easily spread to the TNGC area. This is certainly a serious threat to forest fire control activities.

3.4. Analisis faktor internal dan eksternal

The next step of analysis is to analyze the internal factors. Firstly weighted on each factor based on the results of questionnaires by experts. Weighting for the internal environment value should amount to 1. After weighting, then get the total value on each factor by multiplying the rating and weight. The total value will then show how much strength and weakness possessed by TNGC Hall. The calculation results on the strength factor of 1.53 and the total weakness of 1.14. In detail the calculation of internal factors shown Table 3.

Table 3. Internal factor calculation analysis

No.	Internal Factor	Rating	Weight	Total
Strength				
1	Hall TNGC provides an opportunity for MPA to be fully involved in forest fire control efforts	3,00	0,0839	0,25
2	TNGC area has the potential to be developed as an ecotourism area	3,29	0,0874	0,29
3	Hall TNGC seeks to make a new breakthrough in dealing with the incident of forest fires	2,86	0,0874	0,25
4	Membership as a voluntary MPA affects MPA commands in forest fire control activities.	3,14	0,0839	0,26
5	MPA's motivation to engage in forest fire control activities is related to the assurance of income	2,71	0,0909	0,25
6	The Fire Care Society has the capability to support forest fire control activities	2,86	0,0804	0,23
Strength Total				1,53
Weakness				
7	Patrolling activities are conducted regularly by TNGC and MPA Centers	2,29	0,0839	0,19
8	The availability of MPA members owned by Balai TNGC is not sufficient	2,43	0,0804	0,20
9	The availability of funds for forest fire control activities is inadequate	2,14	0,0769	0,16
10	Training activities (refreshing) for MPA organized by TNGC Hall routinely implemented	2,29	0,0804	0,18
11	The availability of fire fighting support equipment is not sufficient	2,29	0,0804	0,18
12	Vegetation of constituents of TNGC are vulnerable to forest fires	2,57	0,0839	0,22
Weakness Total				1,14

Base on the above table it can be seen that, the power possessed by TNGC Hall is greater than the weakness. This indicates that in formulating the strategy, Hall TNGC has greater strength than the weaknesses. Besides, based on internal factor analysis, the factor of TNGC area condition has potential to be developed as ecotourism area has the highest value compared to other factors. It means that the potential of TNGC area as ecotourism area becomes the most priority force in supporting the formulation of forest fire control strategy. Actually, the discourse of TNGC area as ecotourism area through the granting of tourism management license is not new. Only so far, in its implementation has not received serious attention from related agencies so it has not had a real impact for the socio-economic life of the community. In addition, the process of facilitation when the license has been out is very minimal implemented so that the management of tourist areas applied is also not maximal. This is reinforced by the results of research Nurpahiyah et al. (2016) [15], that the management of the ecotourism area has not had a major impact on the economic condition of the community because the management of the applied management has not been maximized. Conversely, the weakness to watch out for is the condition that the vegetation of the constituent TNGC is vulnerable to fire. The vulnerable nature of vegetation to fires indicates the potential for higher fuel levels within the TNGC area.

Tabel 4. External factor calculation analysis

No.	External Factor	Rating	Weight	Total
Opportunity				
1	Motivation to get benefits (eg income) from the presence of TNGC area makes the community contribute to preserve forest kelastarian including from the threat of forest fires	3,57	0,0814	0,29
2	TNGC forest areas have important value for the surrounding community	3,29	0,0847	0,29
3	Communities rely on water availability from the TNGC area	3,56	0,0814	0,28
4	Kuningan regency declared itself as Conservation District	3,43	0,0847	0,29
5	Candidate LHK No. 32 of 2016 on Forest and Land Fire Control provides opportunities for improved forest fire control	3,14	0,0749	0,24
6	Preparation of a comprehensive strategy in handling the incidence of forest fires	3,14	0,0749	0,24
7	Preparation of the concept of community involvement in forest fire control activities	3,14	0,0814	0,26
8	The community has local wisdom in handling forest fires	3,29	0,0814	0,27
Opportunity Total				2,14
Threat				
9	The action of forest fire handling that is carried out still depends on the occurrence of forest fires	2,86	0,0684	0,20
10	People have a habit of clearing land by burning	1,71	0,0554	0,09
11	The community has an understanding of the impact of forest fires on the TNGC area	2,71	0,0749	0,20
12	The people around TNGC are working in the ecotourism sector	2,43	0,0814	0,20
13	Forest fire management is implemented sectorally	2,86	0,0749	0,21
Threat Total				0,91

3.5. Analysis of forest fire control strategy position in TNGC

Although previous SWOT analyzes have been widely applied in support of strategic decisions for business management, it has recently been used for environmental management and assessment [15]. The position of the forest fire control strategy in TNGC is done by determining the point on the SWOT analysis matrix. Determination of the point is done by determining the point x based on the value of internal factors and determine the point y based on the value of external factors. The position of point x is obtained by subtracting strengths and weaknesses, whereas point y is obtained by subtracting the value of opportunity by the threat value.

Table 4. shows that the total strength value is 1.53 and the total value of weakness is 1.14. The total reduction of strength and weakness values has a value of 0.39. The value is positive (+) which means that strategy will be formulated have greater strength compared with weakness. The total probability value in Table 4. shows the value of 2.14, while the total threat value is 0.91. The reduction of both yields a value of 1.23. The value indicates that the opportunity in formulating the strategy of forest fire control by Balai TNGC is greater than the threat faced. The position of that value, placed on the y-axis and above the x-axis of the Cartesian Diagram. The placement of x and y axes on the Cartesian diagram

will result in a point (0.39, 1.23) as shown in Figure 1. The point position on Cartesian diagram is in quadrant I, which means the forest fire control strategy to be developed leads to an *aggressive strategy*.

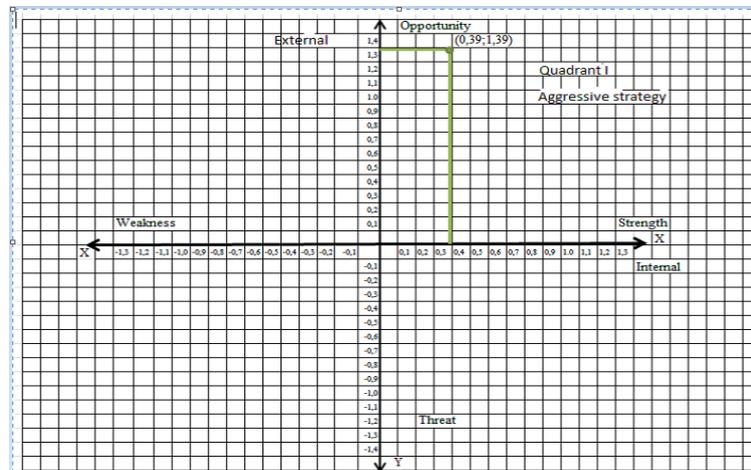


Figure 1. Analyze SWOT diagram

4. Conclusions

The conclusion of this study is that the priority strategy implemented to increase MPA participation in forest fire control efforts in TNGC is an aggressive strategy. The strategy is implemented by maximizing the potential of TNGC area as an ecotourism area through the granting of licenses to manage tourist services to the community thus increasing the importance of the area and increasing community motivation to preserve the forest.

References

- [1] United Nations International Strategy for Disaster 2002 *Yokohama strategy and plan of action for a safer world: guidelines for natural disaster prevention, preparedness, and mitigation*. Paper Read at World Conference on Natural Disaster Reduction, at Yokohama
- [2] Senkowsky S 2001 *A burning interest in Boreal forests: Researchers in Alaska link fires with Climate Change*. *Bioscience* **51** pp 916-21
- [3] Taufiq M 2010 *Behavior Analysis of Drought Index In Vulnerable Areas of Fire, South Sumatra*. *J. Agromet* **24**
- [4] Kayang L 2010 *Spatial Modeling of Fire Risks for Forests and Land in West Kalimantan Province* Thesis (Bogor: Graduate School, Bogor Agricultural University)
- [5] Akbar A, Sumardi, Ris Hadi Purwanto and M Sambas Sabarudin 2011 Study Source Causes of Fire and Community Response in the Framework of Peatland Fire Control in the Mawas Area of Central Kalimantan *Journal of Plantation Forest Research*
- [6] Akbar A 2008 Community Based Forest Fires as an Effort to Overcome Risks In Redd *Journal Tekhno Forest Plant*
- [7] Arifudin, Besri Nasrul and Maswadi 2013 Program of community empowerment prevents forest fires in Indonesian peat land *Procedia Environmental Sciences*
- [8] Karki S 2002 Project Fire Fight Southeast Asia. Bogor: Indonesia, <http://www.pffsea.com>
- [9] Ife J 1995 *Community Development: Creating Community Alternatives - Vision, Analysis and Practice* (Australia: Longman Australia Pty. Ltd.)
- [10] Dube O P 2013 Challenges of wildland fire management in Botswana: Towards a community inclusive fire management approach
- [11] Mayer J 2002 Learning Across Borders: Community-Based Fire Management Kalimantan To California *Proceedings of an international conference on community involvement in fire management*

- [12] Amirullah 2015 *Management Strategy* (Jakarta: Mitra Wacana Mulia)
- [13] Wheelen T L and Hunger J D 2010 *Strategic Management and Business Policy: Achieving Sustainability* (New Jersey:Upper Sadle River)
- [14] Cormick D, M N Kinyanjui and G Ongile 1997 Growth and Barriers to Growth Among Nairobi, Small and Medium Size Garment Producers *World Dev.* **25** (7)
- [15] Nurpahiyah I, Jaka Sulaksana and Delis Hadiana 2016 The Effect of Ecotourism on Economic Condition of Society (A Case On Sangiang Situ Tourism Object in Sangiang Village, Banjaran District, Majalengka District) *Journal of Agricultural And Animal Sciences* **4**
- [16] Martins G, Brito A G, Nogueira R, Urena M, Fernandez D, Luque F J and Alcacer C 2013 Water Resources Management in Southern Europe: Clues For A Research