Shifting contestation into cooperation: Strategy to incorporate different interest of actors in medicinal plants in Meru Betiri National Park, Indonesia

Dodik Ridho Nurrochmat[a,*], Ignatius Adi Nugroho[b], Hardjanto[a], Agus Purwadianto[c], Ahmad Maryudi[d], James Thomas Erbaugh[e]

[a] Laboratory of Forest Policy, Department of Forest Management, Bogor Agricultural University (IPB), Kampus IPB Darmaga, Bogor 16680, Indonesia
[b] Forestry & Environment Research Development & Innovation Agency, Bogor, Indonesia
[c] Department of Forensic Medicine and Medicolegal Studies, Faculty of Medicine, University of Indonesia, Indonesia
[d] Faculty of Forestry, Gadjah Mada University, Yogyakarta, Indonesia
[e] School for Environment and Sustainability, University of Michigan, Ann Arbor, USA

ARTICLE INFO

ABSTRACT

Meru Betiri National Park (MBNP) is home to a variety of medicinal plants that local communities collect for individual use and sale. In MBNP, a variety of actors are interested in medicinal plants for different reasons. This paper analyzes the interest and influence of ten important actors related to medicinal plant collection and use in MBNP: national park management, the Plantation and Forestry Office of Jember District, farmer groups (*jaket resi*), medicinal plant collectors (*pendarung*), medicinal plants purchasers (*pengepul*), small-scale medicinal plant industries of the *Toga Sumber Waras*, *Bandealit* plantation company, a conservation NGO (LSM KAIL), loggers (*blandong*), and log buyers (*borek kayu*). To examine and map the position of different interests and influences of actors involved in medicinal plant usage, this paper uses a power grid matrix. The analysis confirms that five of the ten aforementioned actors play a direct role in the medicinal plant policy process, while five actors do not and can be categorized as context setters, subjects, or crowd. This paper ends by recommending a strategy for considering policy options that promote shared interests and minimize anticipated objection from actors concerning the harvest of medicinal plants in MBNP. It concludes that the utilization of medicinal plants in MBNP, together with protection of natural resources, should become an integral part of the park's conservation strategy.

1. Introduction

The proper conservation of protected areas is essential for biodiversity conservation and for long-term climate change mitigation and adaptation. The effects of human interactions on the "natural component" of national parks are particularly strong at the local level (Carter et al., 2014). Conservation areas in Indonesia are allocated to maintain the protection, preservation, and utilization of natural resources.[1] The human activities permitted in Indonesian conservation areas are thus minimal or completely prohibited. However, many conservation areas, particularly in densely-populated regions, are now under growing pressure from economic-oriented human activities (Herman and Sota, 2014; McCarthy, 2006; Roslinda et al., 2012). Local communities often encroach into conservation areas to obtain forest products for subsistence and income-generating activities (Adetola and Adetoro, 2014). The regulatory regimes focused on ecological preservation often lead to latent conflicts between the management of conservation areas and local communities (Setiawan et al., 2017). These conflicts in Indonesian forests and conservation areas are usually related to issues of tenure and rights to access natural resources (Marwa et al., 2010; Nurrochmat et al., 2012, 2014). Thus, although the most immediate threats to national parks are often local in scale, park management and sustainability is of global concern.

Following Ribot and Peluso (2003), natural resource rights contain de facto and *de jure* elements, and exclusion can be legal and/or informal (Himberg et al., 2009). According to the Ministry of Forestry (MoFor) Decree 277/1997, the legal rights for Meru Betiri National Park (MBNP) belong to the central government, represented by the national park management (BTN). This decree states that the BTN administrates all activities related to the national park. Meru Betiri National Park (MBNP) in East Java, Indonesia, is one of the country's richest preserves of floral biodiversity. It contains 355 plant species within 92 families (Zuhud et al., 2009). Although BTN retains formal control over MBNP, local people have harvested and used natural

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* Corresponding author.
E-mail address: dnurrochmat@ipb.ac.id (D.R. Nurrochmat).

[1] Law 32/2009 on Environmental Protection and Management, article 57, paragraph (2).

resources in this area long before MBNP was formed. This tension between local use and legal exclusion has resulted in conflict between park authorities and local communities (Famuyide et al., 2013).

Medicinal plants are the primary commodities produced from MBNP. Of 355 plant species within the park, 81.7% of them have a known medicinal function (Zuhud et al., 2009). Local people use these plants personally, or sell them for income. However, the price collectors receive for medicinal plants are usually very low (Zuhud et al., 2009). "Middle men" often control the local market price and information about medicinal plant products, and collectors have little control over what they are paid. Consequently, local people over-harvest medicinal plants, which lead to over-exploitation. Medicinal plants are becoming scarce, and collectors have to travel far from their village when they want to collect medicinal plant materials (Nugroho et al., 2016). The utilization of medicinal plant resources must be addressed to ensure the sustainable management of MBNP.

This research evaluates the interests and influences of different actors involved in the collection of medicinal plants within, and the management of, MBNP. This text proceeds in four subsequent sections. The second section establishes the theoretical background that provides the foundation of enquiry and analysis for this research. Section three addresses the methodology used to identify, stakeholders, analyze data, and support conclusions. Section four presents the results from this study, and section five concludes this text by reiterating the main findings and summarizing a policy recommendation that encourages cooperation and minimizes contestation from actors in and around MBNP.

2. Theoretical background

Forests are multidimensional resources in which many actors are often interested (Krott, 2005; Maryudi, 2016). Different actors may have different, even opposite, interests (Hubo and Krott, 2013; Susanti and Maryudi, 2016), and they may compete for priorities to achieve their respective interests (Schusser et al., 2015, 2016). Reed et al. (2009) suggest that analyses of policy implementation and outcomes should seek to understand the role of involved actors. In policy sciences, an actor is often defined as a social entity, a person, or an organization, that is "able to act on or exert influence on a decision" (Enserink et al., 2010, p. 79).

Lunenberg (2012) defines power as the ability to influence others and the ability to exclude other individuals, people, or groups from realizing their influence or interest (Winkel, 2011; Gaus and Kukathas, 2004). Sources of power include personal as well as organizational power. There are five source of power: legitimate, reward, coercive, expert, and referent power (French and Raven, 1959; Raven, 1992). The two most important factors for discussing power are interest and influence (Reed et al., 2009). Enserink et al. (2010, p. 54) define interests as "the total of values and desires that an actor finds important, regardless of the specific situation." They include several categories and sub-categories. Within social interests, actors may have interests in social equity and justice; within environmental interests, biodiversity and ecosystem welfare; and within economic interests, growth and competitiveness.

In this paper, referring to Lunenberg (2012), power is an actor's ability to influence others according to their interest concerning medicinal plants in MBNP. Actors who compete for access to the forest and its resources compete to gain power over natural resources (Ribot and Peluso, 2003), including access to the medicinal plants. Access differs from a strict property rights. It is "a bundle of power" whereas property is defined as "a bundle of rights" (Ribot and Peluso, 2003). Securing rights does not necessarily lead to the ability to benefit from the forests. This paper assumes that actors who harvest medicinal trees as timber, compete with the others who utilize plant materials for medicine, research, or biodiversity preservation purposes.

This paper evaluates different interests in medicinal plants in a multi-actor environment. Assuming that "… no individual single actor will be able to unilaterally impose their desired solution onto the others" (Enserink et al., 2010, p. 79), actors are interdependent and they must cooperate. Thus, knowing who the actors are, and understanding their role in medicinal plant utilization, is important for mapping their interest and influence to define their power. This paper presumes that mapping actors will support information for strengthening the policy process regarding different interests and influences of actors toward medicinal plants. Thus, it is important to analyze the range of actors involved and their networks (Enserink et al., 2010).

To provide a summary illustration of important patterns in the actor environment, "power-interest matrices" have certain advantages over tables (Enserink et al., 2010). Within these matrices, the power and interests of actors classifies different actors, whereas pluses and minuses are used to indicate if an actor supports or opposes the main interests and objectives of a defined problem (Enserink et al., 2010).

3. Methodology

Data collection and field observation were conducted from January to August 2015 in two villages, Andongrejo and Curahnongko, which are adjacent to the national park. These villages were selected purposively, based on the regularity with which their inhabitants collect medicinal plants in MBNP.

The methodology for this research relies most on guidelines for stakeholder analysis using power-interest matrices (Eden and Ackermann, 1998; Bryson, 2004; Reed et al., 2009; Enserink et al., 2010). Since this method of stakeholder analysis focuses on the dimensions of power and interests of actors, actor networks were investigated first, followed by the perceptions of actors. Following Enserink et al. (2010), the procedure for actor analysis proceeds through the following steps: 1) defining a problem as a "departure" of analysis; 2) making an inventory of the actors involved; 3) investigating tasks, authorities, and relations between actors and the current legislation; 4) determining the interests, objectives and problem perceptions of actors; 5) mapping out the position of actors by making inventories of resources and the subjective involvement of actors with the problem; 6) promoting a strategy to incorporate the different interests of actors, which is thought to minimize objection and allow for maximum cooperation among actors.

This paper discusses the presence of different actors that hold conflicting interests, expectations and activities related to medicinal plants in MBNP. Fig. 1 illustrates the analytical framework for evaluating the power of different actors according to their interest and influence in relation to medicinal plants.

The initial step of this study was to investigate the activities within and surrounding MBNP and their (potential) threats to park conservation as the "departure" of analysis. Then, we made an inventory of actors involved in the analysis and investigated their tasks, authorities and relations of actors as well as rules and regulations. Twelve key-informants, representing ten different actors, were purposively selected for in-depth interviews using snowball sampling. The positions of these key-informants include: the head of Meru Betiri National Park, the section head of medicinal plants/non-timber forest products of the park, the section head of forest planning of the Plantation and Forestry Office of Jember District, the head of the medicinal plants farmer groups (*jaket resi*), the coordinator of medicinal plant collection (*pendarung*), purchasers of medicinal plants (*pengepul*), the owner of the small-scale medicinal plant industry *Toga Sumber Waras*, a manager of *Bandealit* plantation company (who is also the acting as chairman of a village inside MBNP), the founder and chairman of the non-government organizations (LSM KAIL), the coordinator of logging activities (*blandong*), and log purchasers (*borek kayu*).

The interviews and observation provided information for understanding actors' interests, objectives, and perception of problems. These data were structured into overarching problems that medicinal plant
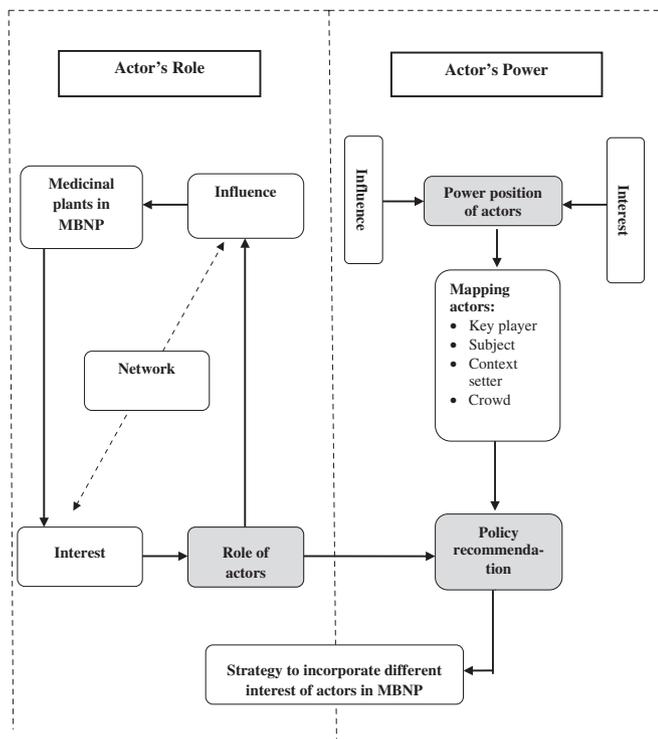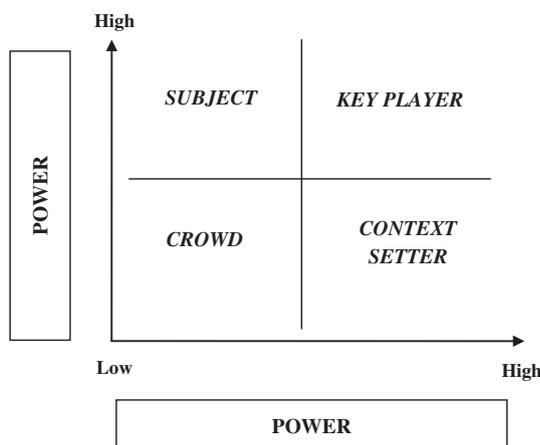
Fig. 1. Research framework.

Source: Eden &Ackermann (1998); Bryson (2004)

Fig. 2. Power grid matrix of actors based on interest and power.

utilization in MBNP pose, which were then used to map actors and plot them in a power-grid matrix. These analytical results were interpreted, and contribute to policy recommendations. This research considers direct as well as indirect actors to reveal the sphere of activities that influence the utilization of medicinal plants in MBNP. Referring to Eden and Ackermann (1998), Bryson (2004) and Reed et al. (2009), a power-grid matrix positions actors into four quadrants: key players, subjects, context setters, and the crowd (Fig. 2).

"Key players" are actors with high interest and strong power, reflected by their influence, in policy making related to the utilization of medicinal plants. "Context setters" are actors who have high power but low interest in medicinal plant utilization. Actors are positioned as "subjects" when they have low power but high interest, and actors are labeled "crowd" if they have low interest and weak power in the policy process concerning medicinal plant utilization in MBNP. Each actor's interest and power defines their different interdependencies (Eden and Ackermann, 1998; Bryson, 2004; and Reed et al., 2009). Following

theories of power (Lunenberg, 2012) and actors (Enserink et al., 2010; Reed et al., 2009), Nurrochmat et al. (2015) use the level of influence in the policy process to measure the power of actors. Thus, a powerful actor has both strong interest and strong influence. We measure "interest" and "power" using scores obtained from key informants' interviews. Those scores ranged from negative five to five (not including zero) and are defined in Tables 1 and 2.

In the final step, evaluation of the interest and power of different actors is used to promote a policy option. This option outlines a strategy to minimize objections from, and promote the common interests of, all actors in the study (Nurrochmat et al., 2016).

4. Results and discussions

4.1. Network of actors and their interests in medicinal plant utilization in MBNP

This paper asserts that actors have three general interests in MBNP. First, conserving and protecting forests through rehabilitation programs; second, using non-timber forest products, such as medicinal plants, to generate income (see Famuyide et al., 2013; Giliba et al., 2010); and third, illegal logging of commercial timber of medicinal trees, such as *bayur* (*Pterospermum javanicum*) and *suren* (*Toona sureni*).[2] Table 3 shows key-informants, power, interest, and role of actors in and around MBNP.

The national park management (BTN) prioritizes ecosystem preservation as well as the sustainable utilization of natural resources in the park, including medicinal plants. *Pendarung* (PDR) extract medicinal plant materials such as leaves, fruits, seeds, or flowers and sells them to *pengepul* (PGL). PGLs also collect medicinal plant materials from *Jaket Resi* (JRS), a farmer group that manages medicinal plants in MBNP. Those plant materials are then sent by the PGL to herbal medicine home industries, which comprise the *Toga Sumber Waras* Company (TSW). LSM KAIL (LSM), a conservationist NGO, supports JRS in the sustainable harvest and sale of medicinal plants from MBNP. However, not all actors extract plant materials for medicinal purposes. *Blandong* (BLD) harvest medicinal trees illegally for high quality and valuable timber, particularly focusing on the harvesting timber of *bayur* and *suren*. Then, BLDs sell those logs to a log trader, *Borek Kayu* (BKY). Currently, some areas of MBNP have been degraded due to those illegal activities, causing declining yields of medicinal plant materials.

The plantation and forestry service of Jember District (HUT) and *Bandealit* Plantation (BAP) has no direct relationship with medicinal plant utilization in MBNP. While MBNP is managed by national park management (BTN), HUT is manages state forests outside the national park. However, as a state institution, HUT has to support the sustainability of forests, including MBNP. This institution is also obligated to rehabilitate degraded forests surrounding MBNP with multipurpose tree species. Fig. 3 describes the role and network of different actors involved with medicinal plant utilization in MBNP.

Each farmer, as a JRS member, has the right to manage a one half to one hectare of land for medicinal plants in MBNP, according to the forest rehabilitation program. This program is supported by LSM. Medicinal plants are usually cultivated in MBNP through an alley cropping system.

To ensure sustainability, JRS members have to retain half of the harvested medicinal plant materials in the soil, allowing them to continue to grow. Although JRS primarily harvests cultivated plants, PDRs typically harvest naturally occurring medicinal plants on a seasonal basis. The medicinal plant materials extracted by PDRs are often of lower quality, because there is no harvesting management or maintenance of plant quality. Further, medicinal plant materials sold by the PDR are also often contaminated by ash, bacteria, fungi and other

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[2] Interview to the Head Office of Meru Betiri National Park (2015).

Table 1
Criteria for measuring interest of actors toward sustainable medicinal plants in MBNP.

High interest	Score	Low interest	Score
Interest in utilizing and conserving NTFP, including medicinal plants, and also having both capacity and authority	5	Interest in utilizing timber by following regulations and having capacity and authority to implement SFM	− 1
Interest in utilizing and conserving NTFP, including medicinal plants, and having capacity, but not authority	4	Interest in utilizing timber by following regulations and having capacity implement SFM	− 2
Interest in utilizing and conserving NTFP, including medicinal plants	3	Interest in utilizing timber by following regulations	− 3
Interest mainly in utilizing NTFP, including medicinal plants	2	Interest in utilizing commercial timber other than medicinal trees	− 4
Little interest in utilizing and conserving NTFP	1	Interest in utilizing commercial timber of medicinal trees	− 5

Table 2
Criteria for measuring power of actors toward sustainable medicinal plants in MBNP.

High power	Score	Low power	Score
Having direct influence on protecting or disturbing MBNP and having authority to influence policy making	5	Having indirect influence on protecting or disturbing MBNP and having authority to influence policy making	− 1
Having direct influence on protecting or disturbing MBNP as well as in policy making	4	Having indirect influence on protecting or disturbing MBNP as well as on policy making	− 2
Having direct influence on protecting or disturbing MBNP and indirect influence in policy making	3	Having indirect influence on protecting or disturbing MBNP and indirect influence on policy making	− 3
Having direct influence on protecting or disturbing MBNP and less indirect influence in policy making	2	Having indirect influence on protecting or disturbing MBNP and less indirect influence on policy making	− 4
Having direct influence on protecting or disturbing MBNP, but no influence in policy making	1	Having indirect influence on protecting or disturbing MBNP, but no influence on policy making	− 5

materials, since they often stay in the forest for 1–2 weeks per season before being sold to the PGL.[3] PGLs then sort all the raw materials based on their use (medicinal plant materials or spice) before selling them to the market. The largest concern for the continued utilization of medicinal plants in MBNP is medicinal tree logging. BLDs directly support actors who illegally log, while BKYs play an indirect role. BLDs know where commercial medicinal trees are located in the park and will cut them when they receive an order from a BKY. BLDs and BKYs have developed a network of informants, some of them forest rangers, for securing their production activities. Building this network helps them obtain information about the schedule of patrol or supervision to combat illegal logging in MBNP. BLDs and BKYs give money to those informants for their "services." Although BKYs do not directly conduct illegal logging activities, they strongly influence the depletion of medicinal trees. Cutting medicinal trees to obtain timber directly competes with PDR activities in extracting medicinal plant materials.

Although medicinal tree crops offer a viable option for rubber and coffee production, BAP alone demonstrates little interest in medicinal plant utilization. However, since BAP is located within MBNP, and many villagers work in this plantation, it is important to the overall management of the national park. The plantation workers established a village inside the national park enclave, and this village is recognized by government. Thus, the plantation cannot be excluded from the park management strategy.

4.2. Power positions of actors related to medicinal plant utilization

We evaluate the power of each actor for medicinal plant utilization through its interest's position in a four grid matrix (Fig. 4).

Fig. 4 indicates that the national park management (BTN), the non-government organization of KAIL (LSM), medicinal plant harvesters/ *pendarung* (PDR), the medicinal plant farmer's group/*Jaket Resi* (JRS), and the medicinal plant traders/*pengepul* (PGL) are key players in the utilization of medicinal plants in MBNP. As key-players, these five actors have the highest interest and strongest power in medicinal plant utilization.

LSM and BTN have different roles and approaches to program implementation. LSM has a closer relationship with villagers and, therefore, has higher trust than BTN within the two sample villages. BTN, as a government agency, has much higher legitimate power than LSM in the policy process related to medicinal plant utilization. In contrast with LSM, BTN usually uses coercive power to implement government programs in the villages.

The Plantation and Forestry Agency (HUT) and the herbal medicine home industry of *Toga Sumber Waras* (TSW) are "subjects" in the power-grid matrix. They have interest—directly or indirectly—in medicinal plants, but low influence in the process related to medicinal plant utilization in MBNP. Although HUT has a peripheral interest in medicinal trees, its authority is for forest management outside national park, and so its influence in MBNP is low. Similar to HUT, TSW has no influence to control medicinal plant utilization in MBNP, but it has a high interest in medicinal plant yields because it uses medicinal plant materials to produce traditional herbal medicines. Though they have low influence, these "subjects" may strengthen their power when actors collaborate or build an alliance with them.

Borek Kayu (BKY) and *Blandong* (BLD) are categorized as "context setters" for medicinal plant utilization in MBNP. BKYs are timber traders who buy commercial logs from MBNP, harvested by BLDs. Since BKY and BLD are interested in timber production, they have no interest in medicinal plant utilization. Their activities, however, strongly influence the sustainability of medicinal plant materials because they extract medicinal trees for high quality wood. This situation challenges national park management and the sustainable harvest of medicinal plants. BKYs maintain a network by paying actors involved in park management, including (some) forest rangers, to supply information about the schedules of supervision of illegal logging operation in MBNP. When demand for timber and an opportunity to illegally harvest timber from the park occur simultaneously, BLDs cut the trees and transport logs to the BKY. BLDs and BKYs have established networks and easily conduct logging activities because these actions benefit many people, not only providing income source for villagers,[4] but also (illegal)

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[3] Personal interview with coordinator of pendarung group.

[4] Villagers who work as BLD are estimated to generate IDR 1–1.25 million per logging activity. This amount has to distribute to 4–5 logging team members, so each member of BLD receives approximately IDR 250 thousands (key informant interviews).

Table 3
Key-informants, power, interests, and roles of actors in and around MBNP.

No	Actors	Key-informants	Power category	Interests	Roles
1.	Meru Betiri National Park office (BTN)	Head of BTN and section head of medicinal plants	Coercive, legitimate	Park protection	A national agency with the authority to manage the park (MBNP). This agency is responsible for protecting the natural habitat and biodiversity of the MBNP as well as improving welfare of the local people surrounding the park. Welfare improvements may include the harvest, usage, and sale of medicinal plants
2.	Plantation and forest service of Jember District (HUT)	Section head of forest planning	Legitimate	Forest management (outside the park)	A local government agency with the authority to manage state forests outside the national park and medicinal plants produced by farmers in the villages around the park
3.	Pendarung (PDR)	Coordinator of PDR group	Reward	Medicinal materials extraction	A collector of medicinal plants for commercial purposes. Usually he/she serves also as a traditional healer for the villagers
4.	Pengepul (PGL)	Owner	Referent, reward	Medicinal materials trade	A buyer (broker) of medicinal plants collected by pendarung (PDR)
5.	Blandong (BLD)	Coordinator of BLD	Reward	Timber extraction	A chainsaw-man or logger who obtains income from cutting trees
6.	Toga Sumber Waras (TSW)	Owner	Referent, reward	Herbal medicine production	A home industry that processes medicinal plants into traditional medicines
7.	Bandealit Plantation (BAP)	HRD manager/Kampung chairman in MBNP	Legitimate, reward	Rubber and coffee plantation	A private plantation company, located in an enclave of MBNP, that plants rubber and coffee. This company was established during the Dutch administration, over one hundred years ago
8.	Borek Kayu (BKY)	Log trader/owner of wood processing unit	Referent, reward	Timber trade	A buyer of logs for commercial purposes (log trader)
9.	LSM KAIL (LSM)	Founder and chairman of LSM	Referent, expert	Environmental protection & community welfare	A Non-Government Organization that has been working within and around MBNP for more than 20 years. Its main activities include building the capacity of the local community around MBNP and participating in the rehabilitation of degraded lands within the park
10.	Jaket Resi (JRS)	Head of JRS	Reward	Medicinal plants cultivation to generate income	A major group of farmers that has managed medicinal plants in the restored lands of the national park. This group has 720 farmer members, spread across three villages: Andongrejo, Curahnongko and Curahtakir

transaction given to public officials.[5] Thus, combating illegal logging in MBNP is a difficult task.

Bandealit Plantation (BAP) is the only actors labeled as "crowd." BAP is interested in planting and producing rubber and coffee, and it has no direct influence in the policy process related to medicinal plant utilization. However, BAP is consulted about program implementation within MBNP, because the company has developed road access from Andongrejo village to the plantation area, and it provides an enclave for 300 people inside MBNP. BAP also allows laborers to cultivate medicinal plants beneath the plantation canopy, using an alley cropping system. By practicing alley cropping, many laborers increase their income while living in the MBNP enclave. Communication with BAP is also important to prevent the encroachment of exotic species, particularly coffee and rubber, into MBNP.

4.3. Promoting the best strategy for sustainable medicinal plant utilization

Poverty, infrastructure development, sectoral egoism, and conflicting or inappropriate regulations are some of the most severe problems related to forest management and natural resource conservation in Indonesia (Marwa et al., 2010; Nurrochmat et al., 2012, 2014, 2015; Erbaugh et al., 2016). Different approaches might assist in formulating a strategy that consolidates the interests of different actors in MBNP. Referring to the theory of multi-actor system (Enserink et al., 2010) and strategies of forest development policy (Nurrochmat et al., 2016), this paper considers two approaches to determine a strategy for incorporating actors' interests: first, choosing an option with the lowest rejection from those different actors. Second, selecting an option that is supported by most actors and allows a synergy among them. To apply these two approaches, each actor should meet and build common interest.

We categorize the interests of actors in MBNP into objects and activities. Two categories comprise "objects":"timber" and "non-timber forest products." "Activities" are dichotomized into "extraction" and "protection." Referring to the multi-actors system theory (Enserink et al., 2010), actors are arranged as either conflicting with or supporting the sustainable medicinal plants extraction. This theory applies to the actors in and surrounding MBNP. Actors' positions in the left and right cells of the four grid matrix indicate their interest position (Fig. 5).

The Policy Strategy Matrix illustrates that three actors are interested in the protection of natural resources in MBNP, while the seven remaining actors favor timber or non-timber extraction. PDR, PGL, and TSW are interested in extracting medicinal plant materials; BKY and BLD are interested in timber extraction. These extraction-focused actors are positioned in conflict with the national park protection (left cells). BTN, JRS, and LSM (right cells) support national park conservation policy through the minimization or prohibition of natural resources extraction in MBNP.

As per the Policy Strategy matrix, BAP, PDRs, JRS, PGLs and TSW are interested in non-timber forest products (upper-left cell). Since they are interested in medicinal plant utilization, these actors are most interested in the development of a larger herbal medicine industry near the national park, and better market access for medicinal plant materials. In contrast to this position, BLD and KY are interested in timber (lower-left cell) and have proposed a licensing policy for logging in the buffer-zone around MBNP.

Although different actors have different aims, they all confirmed that they do not object to promoting the participation of actors external to the park service in national park management. Despite having different preferences toward natural resources in MBNP, all actors have a

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[5] There are two types of illegal transaction concerning logging operation, i.e. costs for gratification and penalty. Gratification of IDR 0.5–1 million is given to forest ranger for securing logging access, while IDR 5–10 millions has to be paid by BKY for a penalty cost in an illegal logging operation. The amount of gratification and penalty may vary depending on negotiation (key informant interview).
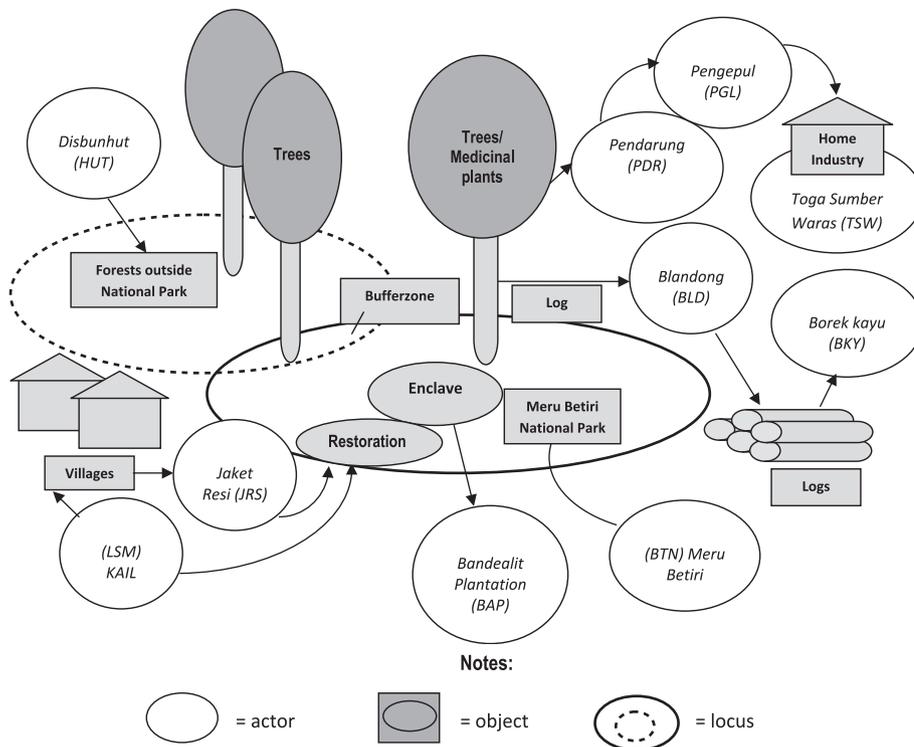
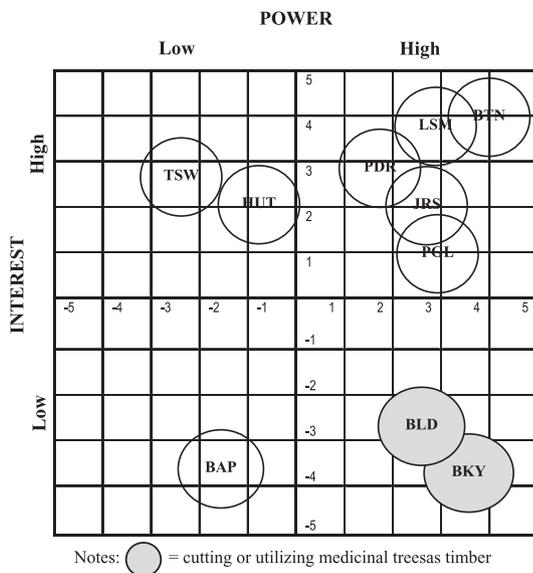Fig. 3. Arena and actors' networks related with medicinal plants in and around MBNP.

Fig. 4. Power grid of actors related to sustainable medicinal plants in MBNP.
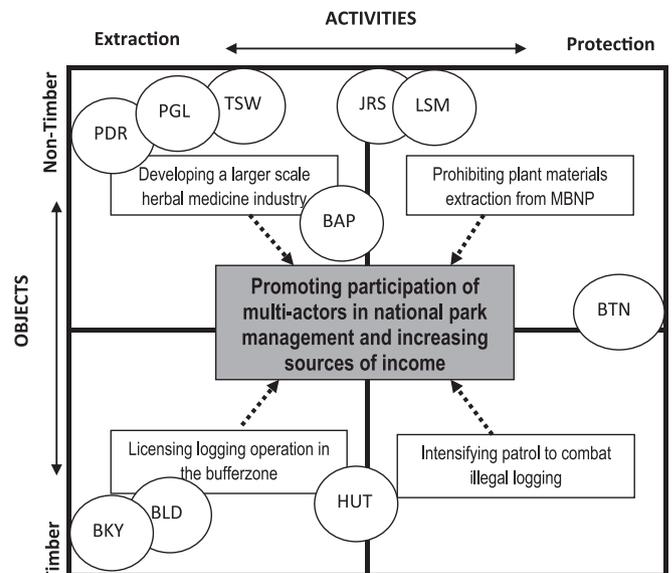

Fig. 5. Policy strategy to incorporate different interests on medicinal plants in MBNP.

common interest in increasing income opportunities. This indicates that actors will support the strategy that promotes better participation in national park management and, at the same time, provides an opportunity for more livelihood alternatives that generate more income, particularly shifting timber to non-timber extraction.

To realize those strategies, the following steps might be considered. First, coordinating a management plan and integrating community empowerment programs among the three institutions that have the authority to manage lands within and around MBNP: BTN (central government), HUT (local government), and BAP (private). It is not an easy task to consolidate the management plans and programs of such different institutions. Building common understanding among actors is a key step for further mutual cooperation. The second step should be

realizing mutual cooperation at the grassroots level by involving other actors directly involved in medicinal plant utilization, including PDRs, JRS, PGLs, LSM, BLDs and BKYs. This cooperation could be implemented by developing an agroforestry program, perhaps by extending an alley cropping system. Such a program might also help rehabilitate degraded forest and improve productivity of the buffer-zone around MBNP, which currently consists of less productive forests and bareland. The third step could be to improve the quality and market access of herbal medicine products, to strengthen competiveness of medicinal plant businesses compared to other livelihood alternatives, particularly logging. If the benefit of medicinal plant businesses is higher than logging, BLDs and BKYs might reduce or even stop harvesting medicinal trees for lumber.

5. Concluding remarks

The medicinal plants in MBNP contribute to the biodiversity in the national park and provide for medicinal and economic benefits to local actors. However, they are currently threatened by different and sometimes contradictory interests. This research asserts that five actors play direct roles in the utilization of medicinal plants in MBNP, while the other five actors play indirect roles. Promoting the sustainable harvest of medicinal plants will likely remain essential for the proper management of MBNP.

One of the most serious threats to the sustainability of medicinal plants in MBNP is the illegal logging of commercial medicinal trees. Strict law enforcement is an option for controlling this threat, but since the problems of logging and natural resource conservation in MBNP are very complex, and driven by social and economic dimensions, successful implementation is unlikely. Therefore, a more effective strategy, proposed as permanent solution to incorporate different interests and mutual cooperation among actors, is necessary. Accordingly, we propose a policy strategy that promotes the participation of actors in natural resource management and improves the competitiveness of medicinal plant utilization and sale compared to other alternative sources of income, particularly illegal logging. To make this strategy work, it is important to ask three land managers in and around MBNP (BTN, HUT, and BAP) to consolidate their management plan and programs to incorporate different interests and to ensure the successful implementation of multi-stakeholder resource management that oversees the harvest and sale of medicinal plants.

Acknowledgment

References

Adetola, B.O., Adetoro, A.O., 2014. Threats to biodiversity conservation in Cross River National Park, Nigeria. Int. J. Conserv. Sci. 5 (4), 547–552.

Bryson, J.M., 2004. What to do when stakeholders matter. Stakeholder identification and analysis techniques. Public Manag. Rev. 6 (1), 21–53.

Carter, R.W., Walsh, S.J., Jacobson, C., Miller, M.L., 2014. Global change and human impact challenges in managing Iconic National Parks. George Wright Forum 31 (3), 245–255.

Eden, C., Ackermann, F., 1998. Making Strategy: The Journey of Strategic Management. Sage Publications, London.

Enserink, B., Hermans, L., Kwakkel, J., Thissen, W., Koppenjan, J., Bots, P., 2010. Policy Analysis of Multi-Actor Systems. Lemma, The Hague.

Erbaugh, J.T., Nurrochmat, D.R., Purnomo, H., 2016. Regulation, formalization, and smallholder timber production in northern Central Java, Indonesia. Agrofor. Syst. 1–14.

Famuyide, O.O., Adebayo, O., Bolaji, O.K.A., Awe, F., Owoeye, A.Y., Awodele, D.O., Adeyemo, A., 2013. Assessment and sustainable management of non-timber forest product used as food and medicine among urban dweller in Oyo State Nigeria. Glob. Sci. Res. J. 1, 007–014.

French, J.R.P., Raven, B., 1959. In: Cartwright, D. (Ed.), The Bases of Social Power. From Studies in Social Power. Institute for Social Research, Ann Arbor, Mich.

Gaus, G.F., Kukathas, C., 2004. Handbook of Political Theory. SAGE Publications, London.

Giliba, R.A., Lupala, Z.J., Mafuru, C., Kayombo, C., Mwendwa, P., 2010. Non-timber forest product and their contribution to poverty alleviation and forest conservation in Mbulu and Babati Districts-Tanzania. J. Hum. Ecol. 31, 73–78.

Herman, H., Sota, Y., 2014. Papua's threatened forest: conflict of interest government versus local indigenous people. S. Pac. Stud. 34, 71–98.

Himberg, N., Omoro, L., Pellikka, P., Lukkanen, O., 2009. The benefits and constraints of participation in forest management. The case of Taita Hills Kenya. Fennia 187, 61–76.

Hubo, C., Krott, M., 2013. Conflict camouflaging in public administration—a case study in nature conservation policy in Lower Saxony. Forest Policy Econ. 33, 63–70.

Krott, M., 2005. Forest Policy Analysis. Springer, Dordrecht, The Netherlands.

Lunenberg, F.C., 2012. Power and leadership: an influence process. Int. J. Manag. Bus. Admin. 15 (1), 1–9.

Marwa, J., Purnomo, H., Nurrochmat, D.R., 2010. Managing the Last Frontier of Indonesian Forest in Papua. IPB, Bogor.

Maryudi, A., 2016. Choosing legality verification as a policy instrument to tackle illegal logging in Indonesia. Forest Policy Econ. 68, 99–104.

McCarthy, J.E., 2006. The Fourth Circle: A Political Ecology of Sumatra's Rainforest Frontier. Stanford University Press, California.

Nugroho, I.A., Nurrochmat, D.R., Hardjanto, 2016. Commercialization of Medicinal Plants in Java Island, Indonesia. Jurnal Manajemen Hutan Tropika (JMHT) 22 (2), 114–125.

Nurrochmat, D.R., Hasan, M.F., Suharjito, D., Budiaman, A., Hadianto, A., Ekayani, M., Sudarmalik, Purwawangsa, H., Mustaghfirin, Ryandi, E.D., 2012. In: Nurrochmat, Hasan (Eds.), Ekonomi Politik Kehutanan. Mengurai Mitos dan Fakta Pengelolaan Hutan, Second edition. INDEF, Jakarta revised version. (in Indonesian).

Nurrochmat, D.R., Dharmawan, A.H., Obidzinski, K., Dermawan, A., Erbaugh, J.T., 2014. Contesting national and international forest regime: case of timber legality certification for community forest in Central Java, Indonesia. Forest Policy Econ. 68, 54–64.

Nurrochmat, D.R., Yovi, E.Y., Hadiyati, O., Sidiq, M., Erbaugh, J.T., 2015. Changing policies over timber supply and its potential impacts to the furniture industries of Jepara, Indonesia. Jurnal Manajemen Hutan Tropika (JMHT) 21, 36–44.

Nurrochmat, D.R., Darusman, D., Ekayani, M., 2016. Kebijakan *Pembangunan* Kehutanan dan Lingkungan. IPB Press, Bogor, Teori dan Implementasi (in Indonesian).

Raven, B.H., 1992. The Bases of Power: Origins and Recent Developments. Department of Psychology: UCLA, Los Angles. CA.

Reed, M.S., Grave, A., Dandy, N., Posthumus, H., Hubacek, K., Morris, J., Prell, C., Quinn, C.H., Stringer, L.C., 2009. Who's in and why? A typology of actor analysis methods for natural resources management. J. Environ. Manag. 90, 1933–1949.

Ribot, J.C., Peluso, N.L., 2003. Theory of access. Rural. Sociol. 68, 153–181.

Roslinda, E., Darusman, D., Suharjito, D., Nurrochmat, D.R., 2012. Analisis Pemangku Kepentingan dalam Pengelolaan Taman Nasional Danau Sentaru, Kabupaten Kapuas Hulu, Kalimantan Barat. Jurnal Manajemen Hutan Tropika (JMHT) XVIII (2), 78–85.

Schusser, C., Krott, M., Yufanyi Movuh, M.C., Logmani, J., Devkota, R.R., Maryudi, A., Salla, M., Bach, N.D., 2015. Powerful stakeholders as drivers of community forestry — results of an international study. Forest Policy Econ. 58, 92–101.

Schusser, C., Krott, M., Movuh, M.C.Y., Logmani, J., Devkota, R.R., Maryudi, A., Salla, M., 2016. Comparing community forestry actors in Cameroon, Indonesia, Namibia, Nepal and Germany. Forest Policy Econ. 68, 81–87.

Setiawan, E.N., Maryudi, A., Purwanto, R.H., Lele, G., 2017. Opposing interests in the legalization of non-procedural forest conversion to oil palm in Central Kalimantan, Indonesia. Land Use Policy 58, 472–481.

Susanti, A., Maryudi, A., 2016. Development narratives, notions of forest crisis, and boom of oil palm plantations in Indonesia. Forest Policy Econ. 73, 130–139.

Winkel, G., 2011. Foucault in the forests – a review of the use of 'Foucauldian' concept in forest policy analysis. Forest Policy Econ. 16, 81–92.

Zuhud, E.A.M., Hikmat, A., Siswoyo. 2009. Strategi Pengembangan Tumbuhan Obat Berbasis Konsep Bioregional (Contoh Kasus Taman Nasional Meru Betiri Jawa Timur). Di dalam: Tinambunan D, Wibowo A, editor. Bunga Rampai Biofarmaka Kehutanan Indonesia: Dari Tumbuhan Hutan untuk Keunggulan Bangsa dan Negara. Bogor. Indonesia. Bogor (ID): Pusat Litbang Hutan Tanaman. Badan Litbang Kehutanan. Kementerian Kehutanan. Hlm 53–64 (in Indonesian).