Benefits over Threats: Understanding Community’s Motivation to Participate in Restoration Initiatives in Gunung Leuser National Park, Sumatra

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Abstract. Gunung Leuser National Park (GLNP), one of Indonesia’s most important conservation sites, has been facing serious pressures due to human activities both within its boundaries and in the buffer zones, leaving a large extent of degraded land in GLNP and its vicinity. As a response, the government along with several civil society organizations have been conducting restoration projects, especially around the borders of GLNP with concessions and villages. A centerpiece of many of these restoration initiatives is community participation. However, there have been limited studies to understand the driving factors of local people participation in such initiatives. In order to better understand what drives community participation in restoration initiatives around GLNP, we conducted a random survey to 111 respondents living in Sei Serdang and Namo Sialang Villages (Langkat District, North Sumatra), where restoration initiatives have been introduced. We found that they do not have a strong dependence on natural resources, which likely explains their rather neutral perspective on forests, i.e. they do not perceive any relations between forests, their livelihood, and threats due to deforestation. The absence of forest protection-related custom among population, mainly due to the cultural heterogeneity resulted from inward migration, further enhances their view on forests. Therefore, those who participated in the restoration initiatives were primarily driven by the opportunity to get additional income and improve their welfare. Based on these findings, we recommend that future restoration-related interventions in GLNP should appropriately consider community perception towards forests to ensure project sustainability and better resources management.

1. Introduction
To enhance the function of Indonesia’s protected areas, Ministry of Environment and Forestry’s (MoEF) Directorate General of Natural Resources and Ecological Conservation (DG NREC) sets a target to restore 100,000 hectares of degraded land in protected areas between 2015 and 2019 [1]. However, by 2017, the attainment of this target remains low, as only 10,443 hectares have been restored, or only 10.4% of the total ecological restoration target [2].

Gunung Leuser National Park (GLNP) is one of Indonesia’s priority sites for ecological restoration, with an estimated degraded forest size of 9,103 hectare that needs to be restored [3]. GLNP has been
gazetted as a national park since 1980 through the Agriculture Ministerial Decree No. 811/1980. Further, in 1981 and 2004, GLNP was designated as a Biosphere Reserve and a World Heritage Site respectively due to its significant position as one of the richest tropical forests in Indonesia and Southeast Asia. Despite its very important status, tree cover loss and deforestation persist in the GLNP, primarily due to pressures from human activities. Several studies note that GLNP as an important Sumatran forest reserve has received an increasing pressure from encroachment, agricultural expansion (e.g. oil palm), timber extraction, infrastructure development [4,5] and even internal refugees [6]. For example, in 2017 tree cover loss (TCL) in GLNP reached 22,700 hectares, or 2% of the total area of GNLP [7].

To protect the GLNP from degradation threats, GLNP Office designated a total area of 299,448 hectares as buffer zone, ranging up to ten kilometers from GLNP border to settlements [8]. Within this buffer zone, the locals are allowed to extract natural resources, especially for agricultural purposes. Yet, allowing human activities within this zone also posed threats to GLNP’s core zone [8, 9]. This is reflected in a high tree cover loss rate of 1,188 ha, especially around the borders of GLNP with plantations and settlements [7].

In an effort to prevent further degradation within GLNP’s ecosystem, the government and local non-governmental organizations (NGOs) have been conducting ecological restoration projects, particularly around the borders and buffer zones of GLNP. One of the projects was ecological restoration in three locations under Cintaraja Resort’s management, namely Cintaraja I (2009 – 2013), Cintaraja II (2013 – 2018) and Cintaraja III (2018 – present). The first Cintaraja restoration project was conducted by the GLNP office together with UNESCO, while the other two were implemented under a cooperation with the Orangutan Information Centre (YOSL-OIC). In conducting the restoration in Cintaraja, the initiators and organizers placed a heavy emphasis on community participation in all stages of restoration, from the planning to the implementation.

Several studies place community participation as one of the keys to successful ecological restoration, as it touches on the connections between people and their landscape management. It is necessary to create awareness and sense of belonging in the community level through involvement of communities in all stages of restoration activities [10]. Placing community as the centerpiece in restoration not only helps achieve ecological restoration goals but also ensure the sustainability of post-restoration program [11]. However, studies about why the community is willing to participate in restoration activities remain limited; most of the studies only discuss the impact of community participation in the success or sustainability of such initiatives [12].

Throughout this research, we consider participatory restoration as a requirement to ensure the sustainability of restoration activities. However, given that the drivers of community participation in restoration activities have yet to be widely studied, we aim to understand why people decided to participate in restoration activities using the Cintaraja restoration projects in the GLNP as a case study. The restoration in Cintaraja has been considered a successful project both in terms of ecology and how it engaged local communities, at least from the government’s perspective (citation).

2. Study Area
Cintaraja restoration projects were implemented by UNESCO (Cintaraja I, 2009-2013) and Orangutan Information Centre (OIC) (Cintaraja II and III, 2013-present). We selected this location after conducting a scoping visit to three different restoration locations within the GLNP (Halaban, Cintaraja, and Tangkahan). Based on interviews and group discussions, these three locations are considered to be successful cases for participatory forest restoration, i.e. in engaging local communities to participate in restoration activities. Cintaraja was finally selected because it is the longest running (since 2009) and because the case has been repeatedly acknowledged by the MoEF as one of successful participatory restoration projects in Indonesia [13].
This research was conducted in Sei Serdang, one of the closest villages to Cintaraja III restoration sites in Langkat Regency, North Sumatra Province (Figure 1). Cintaraja III is the location of the latest, ongoing restoration project in Cintaraja. In total, 70 hectares of degraded land are being restored as part of the project. Most of respondents interviewed lived among the four sub-villages of Sei Serdang (Afdeling 9, Afdeling 11, Afdeling 12, and Sumber Waras), including those who have participated in Cintaraja I – III restoration projects. In Cintaraja III, participatory restoration has been initiated and is being supervised by the National Park Management Section (SPTN) Region VI Besitang, Subsection Region III Stabat, with technical support from the OIC.

Sei Serdang is a relatively isolated village, characterized by limited access to electricity and public facilities, such as schools and hospitals. In terms of land-use, Sei Serdang Village and Cintaraja III restoration sites are surrounded by oil palm plantations owned by private companies, state-owned companies, and local communities. To support the management of these plantations, plantation settlements were built by oil palm companies. The settlers-cum-plantation workers are mostly migrants from other areas of North Sumatra, such as Binjai, Batang Serangan and Bukit Lawang.

There are also several plantations of other non-forest timber products (NTFPs), such as rubber and coffee. As a result of these plantation activities, the forests which are adjacent to settlements and plantations were mostly degraded while intact forest areas are mostly located in the core of GLNP (Figure 1). Therefore, as part of the Cintaraja restoration projects, some of the plantations were cleared and converted back to forests, given their location inside GLNP. Additionally, 18 locals were also affected; their parcels of land must be given up to the GLNP Office to be restored [13].

3. Methods

3.1. Sampling and Data Gathering
This research employed both quantitative and qualitative approaches. For the qualitative analysis, we used several methods including field observation, focus group discussion (FGD) with local communities, and also in-depth interviews with the related restoration stakeholders, including government, OIC and the locals. The qualitative data are analyzed and used as the basis to develop questionnaires and support the quantitative analyses of this research.

We then employed random sampling survey targeting both participants and non-participants of Cintaraja restoration projects aged 17 or older. The survey questionnaire was designed to gather various socio-economic and individual perception data. As such, we combined both open-ended and closed-ended questions. The former was used to capture socio-economic data while the latter was used to capture perception data using Likert scale.

Prior to conducting the survey, we interviewed OIC’s restoration team in Medan and Cintaraja to get the list of restoration participants. Due to the lack of such list we only obtained an estimated number of all Cintaraja restoration participants since 2009 (around 56 people) and the approximate locations of their homes (subvillages of Sumber Waras, Afdeling 9, Afdeling 11 and Afdeling 12, see Figure 1).

To fill such data gap, we decided to use the snowball sampling method, whereby we asked locals about who previously have participated in any restoration activities. The snowball sampling method allows us to utilize the existing link within the target population to identify hard-to-reach individuals, i.e. restoration participants [16,17]. As for the non-restoration participants, we employed normal random sampling in three Sei Serdang’s sub-villages. After five days of survey in April 2018, we obtained 111 respondents (62% male and 38% female). Of 111, only 14 people have participated in at least one restoration activity, lesser than our initial estimation. The total number of respondents represent 12% of the total households in Sei Serdang (n=883) [18].

Using the Euclidian Distance calculation, we found that the respondents live within a range of 2.5 km from the GLNP borders. Most of them (59%) worked in the oil palm plantation, while others identified themselves as farmers (10%), unemployed (11%) and having other types of employment (18%). Among these respondents, 92% are migrants from surrounding districts and regencies as well as islands. Of which, 88% migrated to Sei Serdang to work in the plantations.

3.2. Restoration as Conservation Behavior

There is a wide range of literature discussing the drivers of conservation behavior, defined as something that individuals do to achieve certain conservation goals [19,20]. Further, we refer to Sandbrook’s definition of conservation behavior, i.e. ‘actions that are intended to establish or maintain good relations with nature” [21]. Based on these definitions, we consider forest restoration as an example of conservation behavior, as it is aimed at improving forest and environmental qualities without discarding the existing human-forest relations, thus satisfying the goal-oriented criteria of conservation behavior defined by Kaiser & Wilson [20] . Further, the conservation behavior displayed by a certain individual also suggests that s/he has a strong commitment in a particular conservation-related cause (and vice versa) [19].

In order to better grasp the motives behind one’s conservation behavior, such as participation in restoration activities, we adapted the Rasch model, which has been used to estimate one’s probability to engage in conservation behavior [19,20]. In the Rasch model, the probability of one’s engagement in a conservation behavior is influenced by one’s 1) environmental motivation and 2) realization cost (Kaiser & Wilson, 2004). In addition to the two variables, realization conditions, such as the cultural backdrop, custom, geographical location and even climate, have also been acknowledged as the third factor influencing conservation behavior [19,20].

Based on this model, one’s probability to participate in restoration activities is dependent upon how significant one’s environmental motivation is when it is juxtaposed with the costs and conditions associated with restoration activities. Therefore, the lower the cost of behavior, the higher the probability
of one participating in restoration activities and *vice versa* [22]. These cost and benefit of conservation behavior are also influenced by realization conditions which could either encourage or discourage one’s conservation behavior, depending on the nature of the conditions.

In identifying environmental motivation, realization costs, and conditions, we conducted a series of in-depth interviews and focused group discussion (FGD) with various stakeholders at the local levels, such as the GLNP Office, OIC and local communities. The aim was mainly to capture the factors influencing the willingness to restore and the subsequent conservation behavior based on the specific location and context in Cintaraja. From which, we have identified the factors influencing conservation behavior among the locals living around Cintaraja restoration sites (Table 1).

| Category                  | Influencing Factors                     |
|---------------------------|-----------------------------------------|
| Perceived Benefits        | Reducing human-wildlife conflict         |
|                           | Improving water quality                  |
|                           | Preventing drought                       |
|                           | Improving economic wellbeing             |
| Realization Costs         | Tenurial security                        |
|                           | Losing access to forest                  |
| Realization Conditions    | Gender                                   |
|                           | Household role                           |
|                           | Customary rule                           |
|                           | Restoration information                  |

Environmental motivation refers to one’s perception towards forest and the benefits resulted from one’s behavior that eventually drives conservation behavior. Perceptions towards forest comprise of 1) the level of agreement that communities are not allowed to enter forest and extract its resources, and 2) community’s willingness to protect the forest. Meanwhile, benefits generated from restoration activity include whether restoring GLNP would 1) reduce human-wildlife conflicts, 2) improve water quality, 3) prevent drought, and 4) improve economic wellbeing.

On the contrary, conservation behavior also faces costs that may undermine one’s willingness to participate in restoration activities [20, 22]. In GLNP’s Cintaraja restoration sites, tenurial security becomes the main perceived cost that must be borne by local communities. The incident during which 18 local villagers had to give away their lands to the GLNP Office for restoration purpose [13] has kept them alarmed on the possibility of losing their lands for restoration. As a result, we incorporated two major perceived risks caused by restoration, namely the possibility of 1) losing their lands and 2) being prohibited from extracting resources from lands they were once allowed to access.

Lastly, scholars also found that realization conditions, such as cultural and geographical contexts, play an important role in influencing one’s conservation behavior [20, 19, 23]. Such conditions include gender, household role, customary rule, and restoration activity information. These realization conditions will either endorse or undermine restoration benefits and environmental motivation, which then also influence the probability results for overall participation.

### 3.3. Logistic Regression Model

To provide a statistical proof of the factors influencing one’s participation in restoration, we ran a logistic regression based on Rasch model. The basic idea using the logistic regression is because it is considered
most appropriate when the dependent variable tends to be a discrete choice, which in this case is individual conservation behavior. The variables used in the paper consist of the benefits and cost perceived by respondents as well as conditions influencing their participating in restoration activities. We also include socio-demographic variables as realization conditions, including household role, gender, customary rule and restoration information dissemination. In general, logistic regression model can be depicted in the following equation:

$$Pr(\text{restoration participation}_1 = 1 \mid x) = P(y = 1 \mid x_1, x_2, x_3, ..., x_n)$$ (1)

In this model, the probability of restoration participation (Pr) from an individual is determined by independent variables ($X_1, X_2, X_3, ...$). These independent variables are represented by the benefits and costs associated with restoration activities, knowledge, local values, social norms, and other factors which are closely linked in the to socio-economic and socio-demographic characteristics.

To ensure the validity of the model proposed, we ran three methods of goodness-of-fit to the logistic regression model. First, the coefficient of determination of $R^2$ statistics is used to measure the overall predictive power of the model. McFadden defined the value expected for a good predictive power of the model ranges between 0.2 to 0.4 [24]. Second, the Hosmer-Lemeshow test is employed to assess the suitability of the observed and predicted values from the decile groups of model population [25]. To ensure the suitability of the observed and predicted values, the value of the Hosmer-Lemeshow test needs to be significant at a strong alpha-level. Lastly, likelihood ratio-test is run to see the constrained and unconstrained model from the regression [26]. The value expected for the likelihood-ratio test to fit the unconstrained model is by having a significance at an alpha-level, be it 1%, 5%, or 10% to show the significance of the conservation motivation variables to the conservation behavior of individual.

4. Results

The correlation test shows that not all indicators had significant correlation with one’s restoration participation. To further test the Rasch model in Cintaraja restoration context and to estimate the probability of one’s engagement in a restoration activity based on the seven independent variables, we run logistic regression (Table 2).

| Restoration participation | Coefficient | S.E | Odds Ratio |
|---------------------------|-------------|-----|------------|
| Perceived benefits        | 1.453538*   | 0.8093464 | 4.278225* |
| Environmental motivation  | 1.1043      | 1.032464 | 3.017112 |
| Perceived costs           | -.5192311   | 0.5023905 | 0.5949778 |
| Gender                    | 1.378194*   | 0.7886142 | 3.96773* |
| Household role            | -3.573344***| 1.004044 | 0.0280619*** |
| Existence of customary rule|2.076489**| 1.035218 | 7.976411** |
| Restoration information   | 3.435047*** | 1.039568 | 31.03287*** |
| Constant                  | -11.34207** | 4.665863 | 0.0000119** |

Sample size 111

***/*** denotes significance at the 10%/5%/1% level

From the analyses, the results did not affirm the model proposed in this paper as perceived restoration costs and environmental motivation were not significant in influencing an individual restoration decision. Instead, only perceived benefits and realization costs appeared to be significant (Figure 4). Besides, all realization conditions included in the model also show their significance to influence one’s decision to...
restore and thus strengthen the whole model. Yet, before interpreting these results further, we need to see whether this model meets goodness of fit tests (Table 3).

Table 3. Goodness-of-fit test on restoration participation

| Restoration participation          | Pr>LR    |
|-----------------------------------|----------|
| Perceived benefits                | 0.0013*  |
| Environmental motivation          | 0.4314   |
| Perceived costs                   | 0.8027   |
| Gender                            | 0.1817   |
| Household role                    | 0.0109** |
| Existence of customary rule       | 0.0913*  |
| Restoration information           | 0.0000***|

McFadden Pseudo R²               0.4822
Pr. Hosmer-Lemeshow X²           0.0002***

*/**/*** denotes significance at the 10%/5%/1% level

Overall, the model we proposed has met all three goodness of fit tests used in this paper. The McFadden pseudo R² statistics showed a value of 0.4822, implying the overall model had a relatively sufficient predictive power as defined by McFadden [24]. Predictive power of the model implied the overall power of the independent variables proposed could accurately predict the individual restoration participation decision by almost 50%. The Hosmer-Lemeshow X² test also showed that the model was statistically significant at 1% level. This indicated that the overall model in this study fits the observed data. In other words, there was no significant difference between the trend observed in the proposed model and the observed datasets. Furthermore, the likelihood ratio test indicated that four variables tested including perceived benefits, household role, existence of customary rule and restoration information were found to have significant correlation with the individual restoration participation. However, environmental motivation, perceived cost, and gender did not necessarily correlate with restoration participation at any alpha-level (figure 5).

5. Discussion

While Kaiser & Wilson found that environmental motivation endorses one’s conservation behavior and realization costs undermine it, these variables did not appear to matter in Cintaraja restoration projects. Rather, perceived benefits were found to be significant at 10% alpha-level, ceteris paribus. In other words, people were more inclined to participate in a restoration activity if they understood what benefits they would get from it, be it monetary or non-monetary.

Meanwhile, both environmental motivation and realization costs of restoration were not necessarily relevant to the population as they did not have strong direct interaction with the forest. Descriptive data showed that people living around Cintaraja restoration sites considered the forest to be intact and the existence of oil palm plantations did no harm to the forest (Figure 2).
With such positive perception towards forest quality and oil palm plantation, it indicated the locals saw restoring forest as irrelevant. Apart from a certain level of economic detachment from forest, their perception was also influenced by the fact that most of them worked and lived within oil palm plantations with only 13% agricultural income share. As such, the role of oil palm plantations in supporting their livelihood has replaced the role of forest as the main source of living that is expected from rural communities living around forest areas. Therefore, although realization costs discourage one’s restoration participation decision, yet the fact that the locals living around Cintaraja restoration sites are less dependent on forest has made realization costs, i.e. tenurial security and loss of access to forest, as irrelevant to their context.

Further, realization condition variables were found to be significant in influencing the odds of an individual to participate in restoration activities at least at 10% alpha-level, ceteris paribus. These variables were mainly related to socio-demographic context and access to information, namely gender, household role, forest protection clause and restoration information (Table 2). The analysis shows that the probability of one participating in a restoration activity will be more likely if they are male or non-breadwinner. Within the context of Sei Serdang, restoration is perceived as male activity as it requires physical works and most of the respondents worked in oil palm plantations during the day. Thus, non-working men, such as young adults, were more likely to participate in restoration.

In addition, customary rule and restoration activity information are also found significant in influencing one’s restoration participation decision at 5% and 1% alpha-level respectively. Given that most of populations are economic migrants with diverse cultural background, there has been an absence of customary rule. Yet, the statistical analysis shows that the existence of such rule could become a good instrument to influence one’s decision to participate in restoration activity.

More importantly, ensuring the information about restoration activity and the benefits they would get from restoring forest to be disseminated evenly to the locals is central to ensure high rate of participation. The information on restoration activities has not been evenly distributed given that only 30% got the information. This condition was caused by the lack of information resulted in more than half of the population did not understand how the dissemination of this restoration activity was done. Informed locals claimed to obtain the information through personal approach (23%) and communication media such as mobile phone (18%). Meanwhile, of the 25% of the population that knew about the recruitment process, 16% agreed that recruitment is not publicly announced. Therefore, ensuring proper information dissemination will promote inclusion in restoration activities.

Figure 2. Community’s Perception on Forest Condition Based on Household Survey
6. Conclusion

Participatory restoration which has been known for being successful raised a question as to why people, who have a certain degree of forest dependency, decided to take part in restoring the forest. Our model which was adapted from previous studies has shown that perceived benefits, be it monetary or non-monetary, became the major driving factor that influenced people’s decision to participate in restoration activities. The existence of tenurial security as threats and environmental motivation of local communities in Sei Serdang appeared to be insignificant and did not influence one’s decision to restore. Instead, realization conditions showed some degree of significance. More specifically, the improvement of how restoration activity information is disseminated to the communities will potentially increase participation in addition to ensuring restoration benefits are met.

Further, behavior-based assessment from the community needs to be implemented for a sustainable future-related restoration intervention. In this sense, understanding community’s level of understanding and dependence on forest could be the first step to implement a participatory restoration. If they do not have a good understanding about the role forest and/or low dependency on forest resources, the intervention should start from helping them realize their relationship with forest. In addition, the fact that restoration may consume a lot time and efforts, engaging the young to take part in the initiative is also crucial, especially those who do not have a job. As such, not only will forest be restored, but it will also help these young people to gain a deeper understanding about conservation by engaging them in a positive activity. By doing so, community’s willingness to conserve and protect the forest will be triggered which could make restoration more sustainable.

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