

Research Article

# Perception and Awareness of Local Community to A “Green Wall” Forest Restoration Programme in the Gunung Gede Pangrango National Park, Indonesia

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## ABSTRACT

Forest restoration activities have been being carried out across the globe in order to improve degraded forest ecosystem. For Indonesia context, forest restoration in conservation areas need to consider both ecological aspects and regulating access for the community. A study on perceptions and awareness of local community towards restoration program was conducted from April to May 2021 in Cihanyawar Village, Sukabumi District, West Java, Indonesia. The village located adjacent to the Gunung Gede Pangrango National Park (GGPNP), one of Indonesia’s conservation area that has been gazetted as UNESCO’s biosphere reserve since 1982. The objective of this study is to assess perception and awareness of local community towards “Green Wall” restoration program in the GGPNP. We employed questionnaires method for assessing socio-economic of community. Socio-economic analyses of 100 respondents show that they are at the age range between 30 -50 years (48%), low education level (73%), the majority work as farmers (96%), with the income ranging from 1 to 3 million Rupiah (US\$ 69 to 207) per month (83%). Based on respondents’ age, education level, occupation, and income level, they have a moderate level of perception and awareness of green wall restoration program. Chi-square test shows that the level of community perception is not influenced by age and education levels but influenced by occupation and income levels. While the community awareness level is not influenced by age, occupancy and income level, but influenced by the education level. The results of the study provide evidence that restoring ecosystem is important for the social and economic aspects of communities around conservation area.

**Key words:** awareness, community, forest restoration, green wall, perceptions

## INTRODUCTION

Many protected areas are embedded within human-modified landscapes, where agriculture and urbanization have determined landscape structure and may represent major disturbances to natural ecosystems. Habitat loss and fragmentation are a major threat to biodiversity conservation in this context (Melo *et al.*, 2013a). Rising human populations are largely responsible for the environmental degradation that ecological restoration seeks to repair (Dietz *et al.*, 2003).

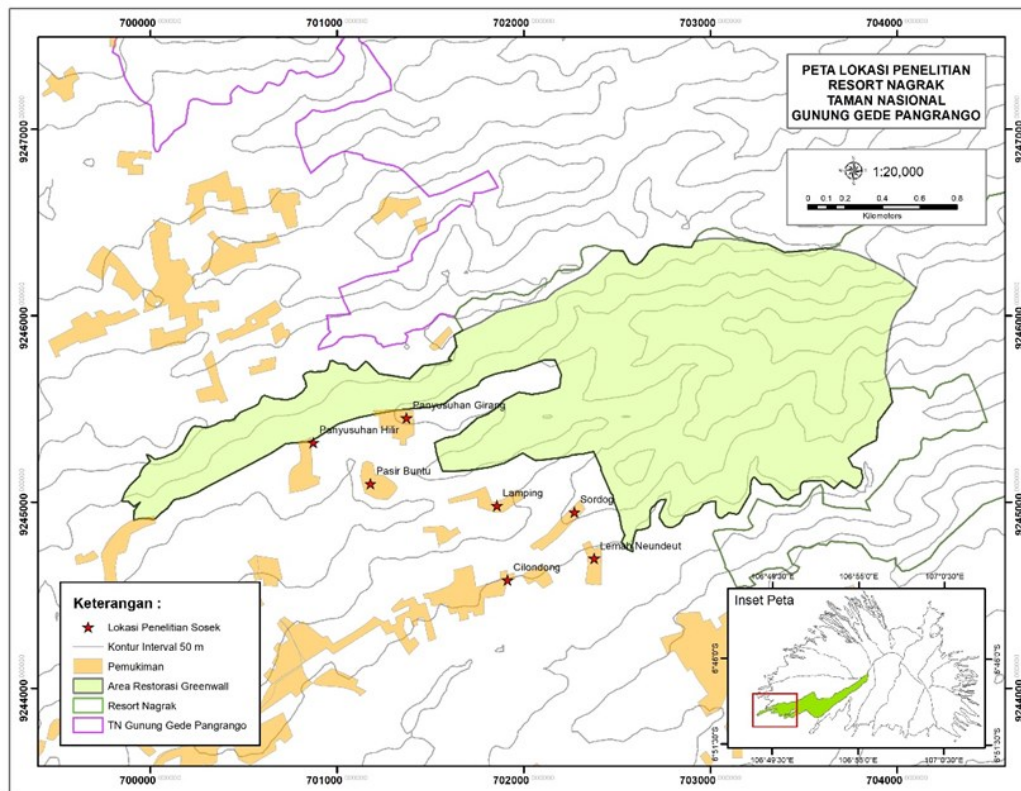
Restoration activities are not typically conducted with the goal of restoring a single ecosystem service. Rather, there is an implicit understanding that ‘healthy’ of ecosystems provide a large number of services and can serve to increase multiple ecosystem services (Bernhardt *et al.*, 2005). The benefits of restoration can be reflected in improved ecosystem services in disturbed areas, but they require to be evenly distributed among stakeholders and across spatial and temporal scales to achieve programs’ success. Social perception of valuation given to a particular service, ecosystem, or group of species would influence the interest on conserving or restoring them (Meli *et al.*, 2016).

Restoration efforts should be planned at the landscape level with the aim of re-establishing ecological integrity and supporting human wellbeing (Maginnis and Jackson, 2003). Restoration for human well-being are intended through the establishment of multifunctional landscapes that improve the provision of ecosystem goods and services to people (Sabogal *et al.*, 2015).

Forest landscape restoration should be implemented to satisfy not only conservation purposes but also socioeconomic needs and values (Wehi and Lord, 2017; Chazdon *et al.*, 2020; Melo *et al.*, 2020). To incorporate social perspectives into forest landscape restoration it is paramount to understand local stakeholders’ motivations, their relationship with the landscape and its natural resources, and their obstacles regarding sustainable land use (Latawiec *et al.*, 2017).

Difficulties to define restoration approaches can be related to social perceptions, including costs and potential economic benefits. Social aspects of restoration still remain crucial to be included, especially considering that most restoration efforts depend on perceptions, main goals, and expectations of several stakeholders (Brancalion *et al.*, 2013; Cáceres *et al.*, 2015).

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**Figure 1.** The map of study area at Cihanyawar Village, Sukabumi District, West Java, Indonesia.

Restoration in conservation areas needs to consider ecological aspects and regulate access to the community. Therefore, an ecosystem restoration model is needed that allows access to be accepted by the community through planting native species as well as benefiting the community. Finally, ecosystem restoration activities can provide dual benefits are ecosystem improvement and community welfare improvement (Hani & Rachman, 2007).

Since 2008, Conservation International Indonesia (CI Indonesia) has been working together with the Gunung Gede Pangrango National Park (GGPNP) to develop the “Green Wall” ecosystem restoration program to restore ecosystems of 300 hectares at critical land in extended area of national park. The green wall is a comprehensive restoration approach that integrates the planting trees efforts with community empowerment, education/outreach and biodiversity monitoring surveys, and putting the people as the main actors and beneficiaries of the ecosystem restoration (Ario *et al.*, 2020). Therefore, the aim of this study is to assess perception and awareness of local community to green wall restoration program in the GGPNP.

## MATERIALS AND METHODS

### Study area

The study was conducted during April-May 2021 in seven hamlets (sub village) in the Village of Cihanyawar, Sukabumi District, West Java, Indonesia. It is geographically located in 106°49'06.99"E / 06°49'47.81"S and is lies around Nagrak Resort of Gunung Gede Pangrango National Park (Figure 1). Those hamlets are adjacent to GGPNP, particularly after the expansion of the national park area.

In 2003, there were 7,655 hectares expansion of ecosystems in the GGPNP, consist of former tree

plantations managed by Perhutani (Forestry State Enterprise), and bare or degraded lands. Species of the plantation are Merkus pine (*Pinus merkusii*), Rasamala (*Altingia excelsa*), and Dammar pine (*Agathis dammara*). Several parts of the expansion area are being encroached by local communities for small scale agricultural activities. The land that is being encroached on are typically on the slopes of the mountain, with steepness of more than 300°, and are very sensitive to landslides and soil erosion (Ario *et al.*, 2020)

### Data collection and analysis

We collected socio-economic data of community through interview techniques using questionnaire sheets for 100 people. The selection of target respondents was based on data from the community involved in “Green Wall” program activities. The questions in the questionnaire consist of four main components are: (a) respondent data, (b) livelihood and income, (c) community perception of the “Green Wall” program, (d) level of public awareness.

The data from the questionnaires were then tabulated using Microsoft Excel, and data analysis was carried out using descriptive methods. The data on perceptions and levels of awareness obtained from the questionnaire results were then calculated using the formula (Daniel, 2002):

$$P (\%) = ni \times 100\%$$

Where:

P = percentage of perception / level of community awareness

$ni$  = the number of samples in the  $i$ -category,  $i$  is the high, medium, and low categories

N = total sample

The categories in question are as follows (Daniel, 2002): a) For answers with a high level of perception/awareness, it is in the interval score of 66.68 to 100; b) for answers with a moderate level of perception/awareness, the score interval of 33.34 to 66.67; c) for answers with a low level of perception/awareness are in the interval score of 0 to 33.33.

To facilitate the process of statistical analysis, prior to data processing, the respondents' answers and characteristics of respondents were scored in accordance with the results of the questionnaire. To determine the effect between variables, we analysed the data using the chi square test on SPSS software version 20, with hypothesis are: if the value of  $\chi^2$  count  $\leq \chi^2$  table, then H0 is accepted, meaning that there is no significant effect between two variables, and if the value of  $\chi^2$  count  $> \chi^2$  table, then H1 is accepted, meaning that there is a significant effect between two variables.

## RESULTS AND DISCUSSION

### *Respondents' characteristic*

The categories of community respondents as a group of independent variables consist of age, education level, occupation and income level. Based on questionnaire data on 100 people, the characteristics of respondents based on age, education level, occupation and livelihood are presented in Table 1.

### *The influence of age, education level, occupation and community income on the level of perception and awareness*

The level of perception and awareness of respondents (high, medium and low categories) on "Green Wall" restoration based on age, education, occupation and income is presented in Table 2.

Based on the chi-square test to determine the effect of age, education level, occupation and income level on community perceptions and awareness, the results are shown in Table 3.

**Table 1.** Characteristics of respondents based on age, education level, occupation and income level.

Variable	Categories	Respondents	
		Σ	%
Age	Young (<30 years)	20	20
	Moderate (30-50 years)	48	48
	Old (> 50 years)	32	32
Education level	Low (Elementary School)	73	73
	Moderate (Junior to senior high school)	26	26
	High (College)	1	1
Occupation	Farmer	96	96
	Employees	2	2
	Students	2	2
Income	Low (<1 million rupiah)	14	14
	Moderate (≥1 to 3 million rupiah)	83	83
	High (> 3 million rupiah)	3	3

**Table 2.** The level of respondents' perceptions and awareness to "Green Wall" restoration based on age, education, occupation and income levels.

Variable	Categories	Level of respondent's perceptions			Level of respondent's awareness		
		High	Moderate	Low	High	Moderate	Low
Age	Young (< 30 years)	3	17	0	0	16	4
	Moderate (30-50 years)	6	39	3	1	39	8
	Old (> 50 years)	7	24	1	0	28	4
Education level	Low (elementary school)	11	58	4	1	62	10
	Moderate (junior to senior high school)	5	21	0	0	21	5
	High (college)	0	1	0	0	0	1
Occupation	Farmer	15	77	4	0	2	0
	Employees	0	2	0	1	79	16
	Students	1	1	0	0	2	0
Income level	Low (<1 million rupiah)	13	33	2	0	43	5
	Moderate (≥1 to 3 million rupiah)	3	44	1	1	37	10
	High (> 3 million rupiah)	0	3	1	0	3	1

**Table 3.** The results of the chi square test on the effect of age, education, occupation and income on community perceptions and awareness.

Criteria's	Value of perceptions				Value of awareness			
	P	df	$\chi^2$ -count	$\chi^2$ -table	P	df	$\chi^2$ -count	$\chi^2$ -table
Age	0.607	4	2.711	3.386	0.798	4	1.659	2.048
Education	0.754	4	1.903	3.088	0.194	4	6.07	4.736
Occupation	0.687	4	2.66	2.247	0.931	4	0.853	1.524
Income	0.009	4	13.62	12.158	0.492	4	3.406	3.832

Note: P = probability, df = degree of freedom,  $\chi^2$ -count = chi square count, and  $\chi^2$ -table = chi square table.

The results showed that the characteristics of respondents among age, education level, occupation and income level were interrelated with each other. From the age variable, the most respondents found in the age range of 30-50 years (48%), low education level (73%), the majority work as farmers (96%), with incomes ranging from 1 million-3 million rupiah per month (83%). These characteristics reflect the typology of people living around forest areas who depend on the natural resources around them for their livelihood. According to Sofiyudin *et al.*, (2016), the GGPNP area is surrounded by residents, most of whom have low levels of education, income, and environmental awareness. Most of the people ( $\pm 75\%$ ) around the GGPNP area are farmers, with the education level only reaching the elementary school ( $\pm 70\%$ ) and junior high school level (Mulyana *et al.*, 2015).

Knowing the social characteristics of the community is one of the success factors of the forest ecosystem restoration program. The perception and level of community awareness are forms of social characteristics that are widely considered for managing community-based conservation areas. Simon (2000) revealed that the socio-economic conditions of the community around the forest are variables that need to be taken into account in formulating forest management objectives. The same thing was also conveyed by Subaktini *et al.*, (2002) that socio-economic characteristics of culture are very influential in forest management.

The category of respondents based on age, education level, occupation and income level, has a moderate level on perception and awareness of the "Green Wall" restoration program. This shows the community's understanding of the importance of forests for life but still needs to increase knowledge related to sustainable use. The results of Sofiyudin *et al.*, (2016) show that the level of public understanding is relatively low on ecosystem restoration in GGPNP. This is due to differences in the groups of respondents in the two studies. Respondents who are not involved in the "Green Wall" restoration program certainly do not understand about the program.

The level of community perception is defined based on Ngakan *et al.*, (2006), consist of: 1) high perception, if the community understands well that they depend on forest resources and want these resources to be managed sustainably, 2) moderate perception, if the community aware that they depend on forest resources but do not understand that these resources need to be managed sustainably so that the benefits can be obtained

sustainably, and 3) low perception, if the respondent's answer falls into the category of not realizing that he or she depends on living from forest resources, or there are other interests that make people tend to think that there is no need to preserve forest resources.

The results of the chi-square test show that the level of community perception is not influenced by age factor and education level. In contrast to Ramdhani (2011) statement which reveals that in general the older people, the worse perception to the forest and the younger the age, the better perception to the forest. Wahyuni and Namonto (2012) also stated the same thing, which different levels of education and lack of socialization about the benefits of conservation areas can cause different perceptions. On the results, meaning that there is no effect between perception and the respondent's age and education level, indicating the level of community interaction with "Green Wall" restoration program activities has a real influence through information that is quite well conveyed and received by the community.

Factors that have a significant effect on perceptions are occupation and income levels. This is because the majority of respondents are farmers who are involved in "Green Wall" program activities from the planning, implementation to monitoring activities in the field, so that the community understands the program well. In addition to income from agricultural products, with the development of alternative community incomes such as fisheries, livestock, and village cooperatives, the community's perception of the benefits of the "Green Wall" restoration program are increased.

Perception is a person's view or assessment of a particular object generated by the ability to organize observations and then determined by factors within the individual and factors outside the individual (Qomariah, 2009). According to Irawan *et al.* (2017), several factors affect the level of perception, consist of age, education level, occupation/livelihood and income level. These factors greatly affect the perception of the forest and its function, how to create a good perception or otherwise of the ecosystem restoration program.

Natural resources cannot be conserved and managed properly without first knowing community perceptions and attitudes towards the environment (Lee & Zhang, 2008). By knowing community perceptions and attitudes towards natural resources, it will be easier to design effective conservation and management strategies to keep natural resources sustainable and to meet the needs of local communities (Dolisca *et al.*, 2007).

The results of the chi-square test show that the level of community awareness is not influenced by age factor, occupation and income level, while the factor that significantly affects awareness is the level of education. There is no effect on the level of community awareness of the three interrelated variables, indicating that public awareness that arises is solely influenced by the process of implementing program activities that have been felt the benefits, even though the age of respondents is in the range of 30-50 years (48%), the majority of work as farmers (96%) with income levels ranging from 1 million-3 million rupiah per month (83%). Yuwono (2006) states that age is a description of individual characteristics based on their experience, that the older a person is the more difficult it is to accept a change or in other words is satisfied with the conditions achieved. With increasing age, the awareness and acceptance of new things decreases. According to Hamdan *et al.*, (2017) community awareness to the importance of forests with the continuity of their occupation will foster positive perceptions of forests. According to Umar (2009), respondents' activities related to forests are aware that their activities depend on the existence of the forest. In other words, if there is no forest, they may not be able to carry out activities.

The education level factor that influences community awareness is related to understanding the sustainable use of natural resources, where the majority of respondents have an elementary school education level (73%). Although the understanding of the benefits of forests has been well understood, knowledge about sustainable forest management is still needed in order to increase community awareness. According to Setiawan (2013), higher education is considered to have more knowledge that can affect perceptions or the higher the level of education, it is assumed that the higher the level of awareness

In general, it can be said that the level of community interaction with "Green Wall" restoration program activities has a real impact through information that is already quite well received by the community, so that it has the impact of changing behavior, one of which is reducing community dependence on forest areas for agricultural land. Questionnaire data also supports this, which is the main reason people no longer practice farming in the national park area because of their own awareness (77%).

The use of forest areas as arable land is carried out by local communities in national park for various reasons such as not having a garden on clan land, for expanding the garden area or for reasons of poverty (Pasha and Susanto, 2009). Community pressure in the buffer zone into the forest area is the impact of several factors such as interests in livelihoods, education level, population density level, and land ownership (Sawitri and Bismark, 2013).

This finding is reinforced by the results of research by Sofiyudin *et al.*, (2016) which states that the reason people no longer open agricultural land in national parks is because of their own awareness. Based on the report by Conservation International Indonesia (2017), every year there is always a decrease in the number of people who are active in restoration areas. The community no longer uses the land for agricultural activities, because the land can no longer be used because there are many

trees stands that continue to grow, thus reducing the activity space for agriculture.

The process of behavior change is a long process, considering that the community is used to going in and out of the forest for various purposes, including carrying out agricultural practices in forest areas. One of the things that makes the community easy to accept the "Green Wall" restoration program is the presence of program implementers who always accompany the community and live with the community for a long time (live in method). This method is quite effective in building community awareness of the importance of forests for the community. Golar (2014) states that a bottom-up strategy that accommodates community participation needs to be applied in the context of sustainable forest management. In the socio-economic aspect, the success of the ecosystem restoration program is influenced by the perception and level of community awareness. Through a policy approach that is environmentally and socially sound, it is hoped that a social buffer for conservation areas can be created which has important meaning for area managers and for the lives of communities around forest areas (Conservation International Indonesia, 2015).

Building awareness is not enough through counselling and theory, but it needs a proof that is easily understood and felt by the community. Provision of clean water facilities for the community is an effective way to build awareness. Touching the daily needs of the community, then providing access to the community to get clean water, is considered more effective in conveying to the community that clean water is available because the condition of the forest is still relatively good. Therefore, it is necessary for community participation together with national park managers to maintain and repair damaged forests so that the availability of clean water for the community continues to be felt in the long term.

## CONCLUSION

The results of the study provide evidence that restoring ecosystem is important for the social and economic aspects of communities around conservation area. The findings of this study show that local people are well aware of the concept of forest biodiversity. The respondents' knowledge of wildlife was relatively limited and varied between sites. People were more concerned with species of wildlife which have direct and indirect effects on their livelihoods. Our results show that an assessment into local people's knowledge and perceptions, can produce useful information that could be incorporated into the decision-making process, protected area management planning and also used as a starting point to improve park-community relationship

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