

Sustainable Development Strategies for Eco-Culture Conservation in Kelimutu National Park, Indonesia

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Abstract—The Kelimutu National Park is located in Flores which has an area of 5,356.50 hectares. This national park has unique landscape, endemic flora and fauna, and a national famous tourism site namely Kelimutu three-color Crater Lake. The arrival of tourists in the year of 2017 amounted to 91,219 people, and about 19.52 % of it was foreign tourists. The main problems faced are poverty and forest encroachment around the national park. The existence of national park does not have positive impact on people's welfare. People living around forests take timber for both household needs and economic needs. This research aims to find the best problem solving strategies that can solve the economic problems of the communities around the National Park and the ecological problems of the National Park. The method used grounded research in phenomenology paradigm. Exploration of theory, analysis and problem solving with socio-economic phenomenon approach existing in local society. The result is sustainable development concept for nature conservation and community welfare around Kelimutu National Park. The concept theme is cultural and local wisdom tourism synergistically supports nature conservation. The communities around national park participate actively in preserving nature and culture conservation, in order to improve the local potency for tourism. The ecology and local culture conservation have a great potential and strong correlation to improve the welfare of the people around the Kelimutu National Park.

Keywords — sustainable development, community empowerment, ecology conservation, local culture conservation, eco-culture tourism

I. INTRODUCTION

Flores Island is located at $8^{\circ} 4'$ to $8^{\circ} 58'$ South Latitude and $119^{\circ} 48'$ to $123^{\circ} 1'30''$ East Longitude is a part of the province of Nusa Tenggara Timur, Eastern Indonesia (Fig.1). The culture of local people in Flores is not only so diverse and exotic but also still well maintained. On the southern island of Flores lies the Kelimutu National Park, covering an area of 5,356.50 hectares. The location of this national park administratively is located in 3 sub-districts: Detusuko District, Wolowaru District, and Ndona District. Kelimutu National Park landscape consists of mountains and hills. The highest mountain is Mount Kalibara, 1,731 meters above sea level. In Kelimutu National Park there are also three color crater lakes that are so famous both in Indonesia and the world. Those three crater lakes are Tiwu Nuwa Muri Ko'o Fai, it has blue color with an area of 5.5 hectares with a depth of 127 meters, Tiwu Ata Mbupu crater, green lake with an area of 4.5 hectares, depth of 67 meters and Tiwu Ata Polo, has dark color with an area of 4 hectares and depth of 64 meters (Fig.2). Kelimutu National Park has natural

interesting potency. The mountainous landscapes and three-color crater lakes are best known as one of national tourist attractions.

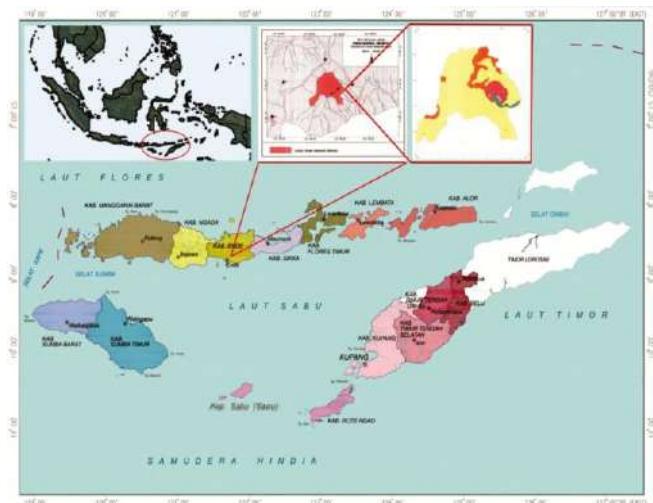


Fig. 1. Location map of the Kelimutu National Park in Flores Island, Nusa Tenggara Timur Province, Indonesia.



Fig. 2. Kelimutu three-color crater lake consisting of Tiwu Nuwa Muri Ko'o Fai (left), Tiwu Ata Mbupu (center) and Tiwu Ata Polo (right).

The endemic flora in the Kelimutu National Park are Arngoni (*Vaccinium varingiaeefolium*). The small white

flowers which will turn to black when they're ripe. The local community's belief said that Arngoni is the food of the gods. Other endemic flora are *Uta Onga* (*Begonia kelimutuensis*) and *Turuwara* (*Rhododendron Renschianum*), *Ajang Kode* (*Toona spp.*), *Cemara* (*Casuarina equisetifolia*), *Kawah* (*Anthocephalus Cadamba*), *Kesambi* (*Schleichera Oleosa*), *Cesi* (*Canarium spp.*), *Kodal* (*Diospyros Ferra*), *Sita* (*Alstonis Scholaris*), the immortal flowers Edelweiss, and many others. The endemic fauna found in the Kelimutu National Park is the *Garugawa* bird (*Monarcha sp.*). Local wisdom of the surrounding community protects the existence of this bird because they consider *Garugawa* birds as ancestral spirits. The *Garugawa* bird is very unique due to its 11 different chirping sounds. Also there are 19 species of birds in the national park that are threatened with extinction. Other endemic fauna include *Lawo* Rats (*Rattushainaldi*), Mountain Rats (*Bunomys Naso*), *Deke* (*Papagomys Armandvillei*), and *Wawi Ndua* (*Susheurenii*). Partridge (*Gallus Gallus*), Bull (*Bos Javanicus Javanicus*), Deer (*Muntiacus Muntjak Nainggolani*), Timor Deer (*Cervus Timorensis*), Wild Boar (*Sus sp.*), Eagle (*Elanus sp.*), Srigunting bird (*Dicrurus Sulphurea*), Civet (*Pardofelis Marmorata*), Pangolin (*Manis Javanica*), Porcupine (*Hystrix Brachyura Brachyura*), Mouse Deer (*Tragulus Javanicus Javanicus*), and others.

Tourists who come to the Kelimutu National Park mainly head for tourist destinations in the three-color crater lake. Tourist visit has experienced very rapid increase in the past five years (Fig.3).

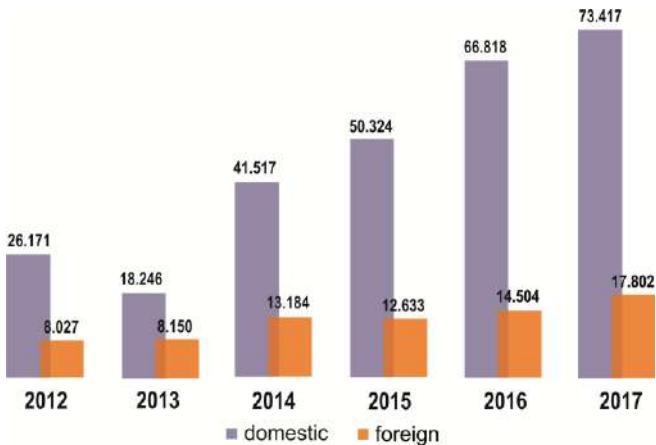


Fig. 3. Data of tourism visit on Kelimutu National Park in the last five years.

The number of visitors have increased very rapidly on the three-color crater lake in the National Park. Even, natural beauty aspects can still be relied on to attract visitors to come.

The indigenous people of the Lio tribe in Flores inhabit villages around the Kelimutu National Park. They live in traditional villages of Wologai, Wolomoni, Sokoria, Wolojita, Kelimutu, Nduaria, Saga and others. Each village has its own uniqueness and distinctiveness. For example, Wologai Village is famous for its carving skills, Nduaria has a special local weaving, in Saga village, there is still a large stone tomb (menhir) culture, and so on. The Lio tribal community around the Kelimutu National Park has an annual customary ritual called *Patika*. This *Patika* customary ritual is always held around Lake Kelimutu in the

National Park area. All villagers around the National Park gather to attend during the *Patika* traditional ceremony.

The main problem in Kelimutu National Park is poverty that still a domination in the surrounding villages (Fig 4). Local communities around the national park do not get much benefit from the existence of the national park. This condition is caused by several factors. First, the national park tourism sector is still focused on the existence of three-color crater lakes. Visitors don't not have any other tourism alternatives. The surrounding local communities do not have many opportunities to play a role and be involved in tourism activities. Opportunities exist only in the informal sector within the National Park. The local communities are only given the opportunity to trade at the shelters provided by National Park. Second, provincial highway access does not go through all the villages around the National Park. Visitors also do not have the opportunity to see the uniqueness and natural beauty of each of the indigenous Lio villages around Kelimutu.



Fig. 4. The face of poverty in villages around the Kelimutu National Park.

This condition causes people to still rely on the economy from the plantation and agricultural sectors with all their limitations. Some local people penetrated the National Park's forests to find wood for economic needs. The local communities also make plantation land within the National Park area (Fig.5). These actions are illegal and unlawful, and even threaten the preservation of the National Park.



Fig. 5. The encroachment of national park by the surrounding community for coffee plantations.

Another threat is the presence of weeds in the form of invasive plants within the National Park area. The weed called *Kirinyuh* (*Chromolaena Odorata*) (Fig.6). *Kirinyuh* is one type of invasive plant. (Permen LHK No. P.94/MENLHK/SETJEN/KUM.1/12/2016). *Kirinyuh* weeds in the Kelimutu National Park are very worrying because they are massively scattered in the forest area (Fig.7). The yellow color on the map shows the spread of the *Kirinyuh* invasion.



Fig. 6. *Kirinyuh* invasive weed (*Chromolaena Odorata*) in the Kelimutu National Park.

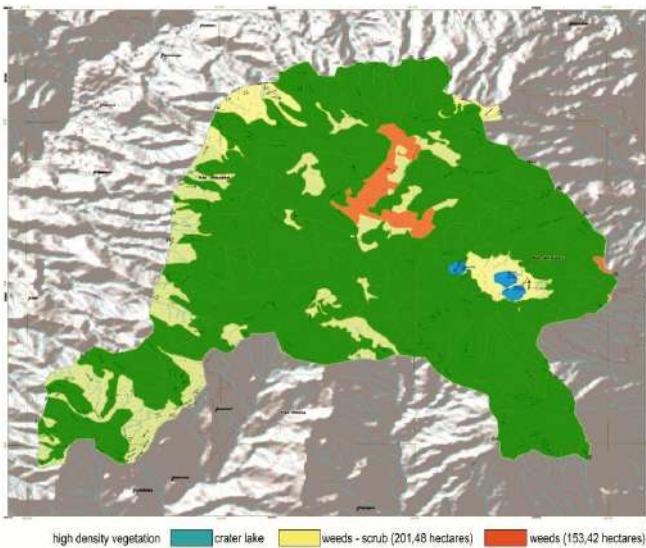


Fig. 7. Map of weed invasion of *Kirinyuh* (*Chromolaena Odorata*).

So, it can be concluded that there are two main problems in the Kelimutu National Park, the economic problems of the local community and the forest ecology of the National Park. These problems should be solved in a way that can be accepted by various parties. The current conditions can lead to a paradox in the Kelimutu National Park (Fig. 8).

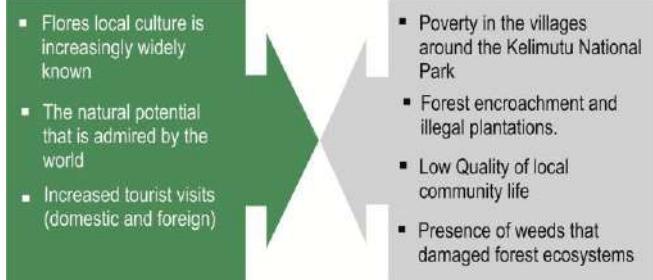


Fig. 8. The Paradox of Potency.

A rapid increase of tourist visits can attract private sector interest to attend and be interested in managing resources and potency of local community. The presence of private capital is potentially able to control natural resources and create lots of opportunities for local communities to be more empowered in their own territory. A capitalist economic system does not encourage real sustainable development. Capitalism will only interested in expanding the capital accumulation and business (Eckersley, 2004). Such conditions can bring the paradox of regional tourism development: tourism is growing rapidly, but the public is only as an audience. Local people are powerless to manage natural resources in their own environment. Tourism is unable to lift the economy of the local community.

The aim of this research is to find the best problem solving strategies that can solve the economic problems of the communities around the National Park and the ecological problems of the National Park. The main research targets is to improve the welfare of the surrounding local communities and preserve ecosystem of Kelimutu National Park.

II. MATERIALS AND METHODS

Sustainable development is able to meet our needs today without losing the ability of future generations to meet their needs (WCED, 1987). This is an ideal concept to be applied on planning of tourism development in Kelimutu. There are three main pillars supporting sustainable development. Those tree main pillars are Economic Development, Community Development and Ecological Development (Winarno, 2013) (Fig.9). Current generation can manage natural resources and environment for their welfare as good as possible, also think about sustainability of these natural resources for future generations. Nature and environment including biological resources, social and cultural resources of local communities are able to continue to be sustainable in the future.

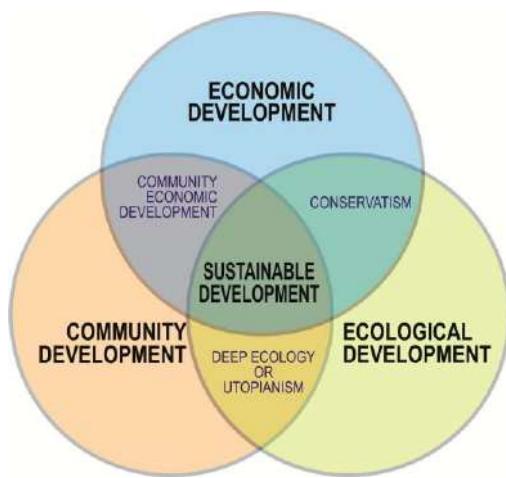


Fig. 9. Three Pillars of economic development (Winarno, 2013).

The concept of sustainable development has economic values, moral values and ecological values (Keraf, 2002; Elliot, 2006). The present generation has moral responsibility for future generations and nature (Pawlowski, 2006) or referred to as "the principle of intergenerational justice" (Hull, 2008). Sustainable development can solve the paradoxical problem of capitalism described in the introduction above. Capitalism contrasts with the aim that local communities are able to manage their natural resources on their own in a sustainable manner. The capitalist economic system does not encourage real sustainable development. Capitalism will suck up the ability of natural resources and local communities, and will leave when nature and the environment can no longer become their investment mines. Failure to manage natural resources will have a very serious impact. Failure to create stability in the environmental field will lead to greater disasters in the future (Stiglitz, 2006). The concept of sustainable development from the local community, by the local community and for the local community is an ideal concept of a model for sustainable development planning in the villages around the Kelimutu National Park. Sustainable development in Indonesia faces many obstacles with fundamental problems in the quality of life and human resources (Abdoellah, 2016). The Bioregionalism philosophy is able to develop to compromise with local human resources. Bioregionalism philosophy is a sustainable community model that emphasizes economic development based on local natural conditions (Keraf, 2013). What is needed is understanding the place where people live, where they live, where we live (Keraf, 2013). Sustainable communities are developed as a culture that integrates economic improvement and ecological sustainability.

This research used an advocacy or participatory paradigm (Creswell, 2013). Research had a reform mission agenda which was expected to improve the lives of local communities around the Kelimutu National Park, both economically, socially and culturally. The research also had a mission so that the local people themselves support the local government in preserving the natural carrying capacity of the environment. The research strategy was carried out qualitatively and descriptively. Methods of data retrieval

and problem tracking were carried out by grounded research observing, phenomenology and field case studies to collect data through observation of physical spatial mapping, socio-economic and culture mapping, and in-depth interviews with local community leaders.

Statistical quantitative data obtained from the Kelimutu National Park management office. Data was compared and elaborated on conditions in the field. The research also explores the aspirations of visitors and local communities through open interview methods with local communities, visitors and managers of the National Park. All data was documented, classified and codified to be analyzed to obtain accountable results.

The collected data were classified and analyzed with the SWOT method. The SWOT analysis technique was chosen because it was considered to be capable of seeing problems from four sides at once, both from the positive side and the negative side of all the potential and problems existing in the Kelimutu National Park. These four sides are strengths, weaknesses, opportunities and threats. SWOT analysis can be used sharply and effectively to find the best steps to solve problems (Fatimah, 2016). The results of the SWOT analysis is able to be a guideline to solve economic and ecological problems in the Kelimutu National Park. The SWOT analysis chart analyzes the problems in the Kelimutu National Park into two subdivisions of analysis, internally and externally (Fig.10). Internally by looking at the strengths and weaknesses that are inside. Externally by observing potential opportunities and threats that come from outside.

III. RESULT AND DISCUSSION

The results of in-depth field observations and research on the Kelimutu National Park had many important factors to be analyzed. These factors were either in the form of positive factors or negative ones. SWOT analysis was relied upon as an analytical tool that was able to produce solutions and various problem solving strategies in the field.

SWOT analysis Table 1 identified the various factors of strengths, weaknesses, opportunities and threats from the conditions in the Kelimutu National Park. Table 1 shows negative factors in the region. These negative factors are weaknesses and serious threats in the Kelimutu National Park. These negative factors become a concern in research to find solutions to problem. Table 1 also shows positive factors of social conditions and situation, community culture and natural environment of the Kelimutu National Park. These positive factors are in the form of strength and opportunities existing in local community and local environment. Excavation and elaboration of these positive factors is expected to be a strategy to empower community to be actively involved in the sustainable development of ecology and culture of local communities around the Kelimutu National Park.

Table 2 analyzes the SWOT impact to look for negative and positive factors in the Kelimutu National Park. Positive factors can be a strategy to arrange and develop the idea for improving the negative factors in the Kelimutu National Park.

Both positive factors in the Kelimutu National Park, are strengths and opportunities, were studied to find a strategy for planning the development of tourism in the National Park. The strategy is able to involve the participation of the community as a whole and integrated. Research can conclude that local tourism which has a great potential to be developed in the Kelimutu region is natural tourism and cultural tourism (Table 2 [a]).

TABLE I. SWOT IDENTIFICATION

STRENGTH – (positif)	
S	1. Tourist attraction, three color crater lake Kelimutu is very well known in Indonesia and abroad.
	2. Domestic and foreign tourists visit shows a tendency to increase from year to year.
	3. Local people have a high interest in participating on local tourism development activities.
WEAKNESSES – (negatif)	
W	1. There was still a lot of poverty in the villages around the Kelimutu National Park.
	2. Inadequate human resource capacity to manage local natural resources
	3. Local communities around the National Park lack of ability to develop local resources
	4. Main road access to three-color lakes Kelimutu has not been connected to all villages around the National Park - Not all villages can take economic benefits from National Park tourism.
OPPORTUNITIES – (positif)	
O	1. Domestic and foreign tourists want to try a new tourist experience (adventure / local culture) in the Kelimutu National Park area
	2. The exotic potential of Flores local culture is able to lure tourists to come
	3. Potential handicrafts of local people have great opportunities to develop
	4. Friendliness of the local community towards visitors / tourists.
THREATS – (negatif)	
T	1. Forest encroachment National parks and illegal plantations carried out by local communities.
	2. <i>Kirinyuh</i> weed invasion in Kelimutu National Park threatens the preservation of the National Park's forest ecosystem.
	3. Capitalism / the presence of investors are able to take over the empowerment of local communities to manage their own natural and local cultural potency.

Planning new alternative tourism ideas that attract tourists to visit Kelimutu. (Table 2 [b]). Those new tourism criteria are demanded greatly by tourists and can empower local communities massively. Development of new tourism alternatives in the Kelimutu National Park area by reviewing the points in Table 2 [a]. New experiences that's able to be developed for tourists are adventure tours based on local culture and natural beauty found in the Kelimutu National Park.

TABLE II. SWOT ANALYSIS

	OPPORTUNITIES (positif)	THREATS (negatif)
STRENGTH (positif)	[a] Potential tourist Development of the Kelimutu National Park: an integrated nature adventure in the local culture of the Flores community.	[d] Integrated planning to develop tourist destinations in Kelimutu
WEAKNESSES - (kelemahan) (negatif)	[b] Creating a new experience for tourists visiting the Kelimutu three-color crater lake / Kelimutu National Park	[e] The concept of a buffer village that supports cultural and ecosystem conservation efforts in the Kelimutu National Park
	[c] Empowerment of local communities will reduce the presence of outside investors so that local people feel the most economic benefits from development in their region.	[f] Utilization of <i>Kirinyuh</i> weeds as plants that can benefit the local community
	[g] The adventure tour development base on local culture by tourist trekking paths planning from surrounding villages to three-color crater lakes.	[i] Reducing / eliminating all major problems / conflicts with Sustainable development strategies for Ecological and Cultural Local communities Conservation in the Kelimutu National Park through the principles of Bioregionalism (integration of cultural preservation, economic improvement and ecological sustainability)
	[h] Mentoring program to improve the ability of local communities in the adventure tourism sector and local culture.	[j] Training for improving community skills increases the potential of local crafts.

The development of natural tourism and cultural tourism must involve the participation of local communities as the main players (Table 2 [c]). Local communities must be fully involved in order to be more empowered in their own homes. Tourist developers from outside or outside regional investors need to be given clear boundaries regarding to the rules for investing in Kelimutu National Park. In this case, local government of Ende or Nusa Tenggara Timur and management office of the Kelimutu National Park need to immediately launch the issue regulations concerning investment policies in the Kelimutu National Park. Local people need to be empowered as subjects in their area. This strategy makes the local people themselves feel that they have ownership and have responsibility for their natural and cultural sustainability. Local nature and culture providing great opportunities for the economy of the local community for the survival of their lives. The local communities themselves will realize that their local tourist attraction must be maintained so that its economy is sustainable.

The analysis also considers the potential strengths to develop strategies to reduce threat factors in the Kelimutu National Park. The analysis concluded that there was a need for an integrated planning of the Kelimutu National Park as a whole (Table 2 [d]). Sustainable development planning is not only carried out in the Kelimutu National Park area but also in villages around the National Park. Traditional villages around the National Park are included in the concept of the National Park buffer zone (Table 2 [e]). Villages around the National Park are bound to a traditional unit and are met in Patika traditional ceremonies once a year (Fig. 11).



Fig. 11. Patika custom ceremony in Kelimutu.

The traditional Patika ceremony has strategically united villages around the Kelimutu National Park in a customary union. This unity was developed into the concept of supporting villages that support the existence and preservation of nature and culture in the Kelimutu National Park (Fig. 12).

National Park management office can encourage research into the use of *Kirinyuh* weeds by research institutions or universities. Utilization of weeds is intended to benefit the community in traditional villages around the national park (Table 2 [f]). Utilization efforts as well as an effort to

eradicate the development of massive weeds in Kelimutu National Park. Currently *Kirinyuh* can be used as a biomass stove fuel.

The next analysis is the study of the negative factors (weaknesses) by elaborating the positive factors (opportunities). The analysis provides results that integrated regional development in the Kelimutu National Park will create many new opportunities in the field of employment for local communities (Table 2 [g]). Tourism can reach various fields of life. Integrated planning leads to opportunities to create employment as wide as possible for local people. The potential that can be developed is tourism with an emphasis on nature conservation and preservation of local culture.

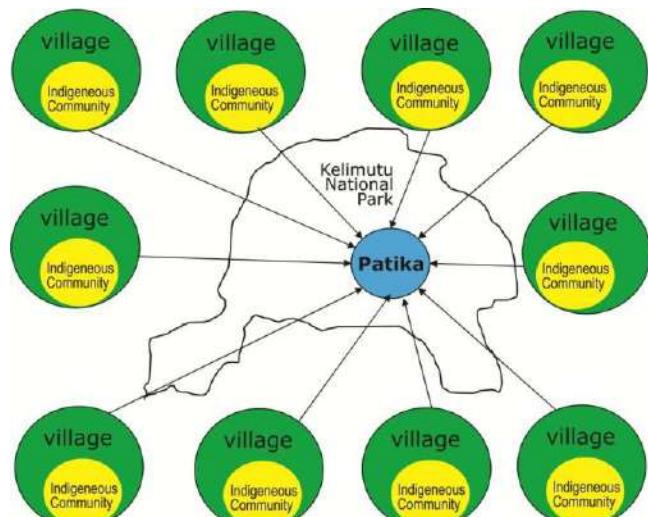


Fig. 12. Concept of Kelimutu National Park Buffer Area.

The analysis also brought together two negative factors in the research area, the weaknesses and threats in Kelimutu National Park (Table 2 [f]). The elaboration of these two negative factors by considering the positive factors in the region resulted in a sustainable development strategy for Ecological and Cultural Preservation of local communities in the Kelimutu National Park through the principles of Bioregionalism (integration of cultural preservation, economic improvement and ecological sustainability). This concept is concluded to be the most appropriate concept to reduce and even eliminate all potential conflicts and paradox problems existing in the Kelimutu National Park.

The implementation of activities that can be carried out between the Ende District Government and the National Park Office is the strategy of empowering the community by developing the potential of buffer villages around the National Park to become cultural tourism and adventure villages (Fig. 13).

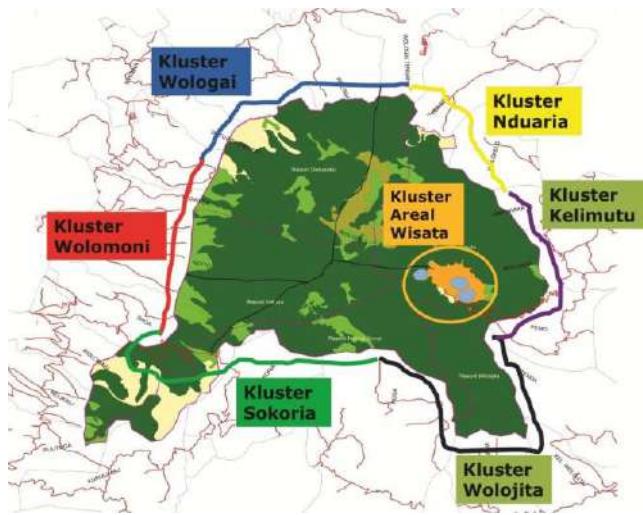


Fig. 13. Local community development and empowerment of Kelimutu National Park.

These villages have a strong cultural tradition and have an appeal to be developed into tourist villages. The villages also have the characteristics and exoticism of the Lio ethnic culture, which is different from one another. Development of access connecting 3 color crater lakes Together with traditional villages around the Kelimutu National Park area is through the development of trekking paths from three traditional villages, Wologai Village, Wolomoni Village and Ratebeke Village (Fig. 14).

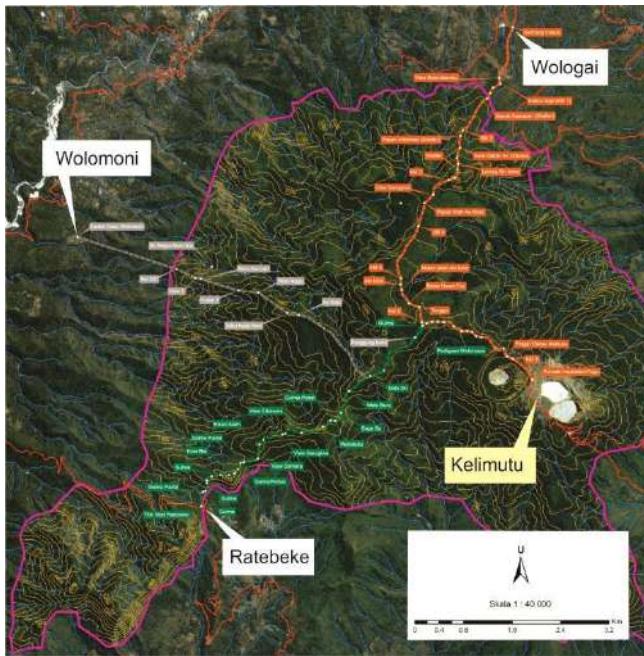


Fig. 14. Development of a trekking trail for adventure tours from three traditional villages (Wologai Village, Wolomoni Village and Ratebeke Village) to the three-color crater lake around Kelimutu National Park.

In these buffer villages, tourists are especially interested in nature and local culture adventures to stay in traditional villages. Local communities in Wologai village, Wolomoni village and Ratebeke villages are provided with assistance in

the management of tourists. Customary villages can be functioned as an adventure starting points to the three-colored Kelimutu crater lake or vice versa. After seeing the three-color crater lake visitors can walk through trekking path to the traditional village to stay. In these traditional villages, tourists do not only enjoy but also feel the natural atmosphere of the traditional Lio tribe (Fig. 15). Tourists can also buy food and community crafts.

Ende district government and the Kelimutu National Park Office can provide community assistance to fill job opportunities that support these cultural tourism. The role of local communities is much needed as a tour guide, accommodation (local community housing as a guest home stay), traditional village receptionists, local food and beverage providers, as well as other supporters such as local craft development and language translator services. With the development of tourism that cooperates with indigenous people around.



Fig. 15. Wologai traditional village, one of the three villages as a gateway to adventure trekking tours to Kelimutu three color crater lake.

Other efforts that need to be carried out by the National Park Office are research and development of sustainable use of *Kirinyuh* (*Chromolaena Odorata*) weeds in the National Park area. Utilization of *Kirinyuh* weeds as fuel for biomass stoves for cooking in villages around the national park (Fig.16). The use of dried *Kirinyuh* stems as fuel for cooking will help the Kelimutu National Park Office eradicate weeds that disturb forest ecosystems. National park office can provide free stoves to indigenous peoples in villages around the National Park.

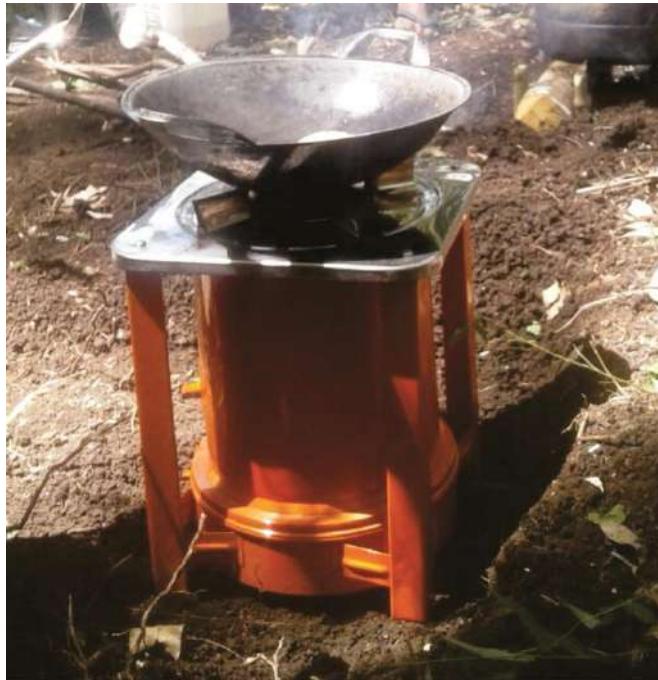


Fig. 16. Biomass stoves that use dried *Kirinyuh* stems as a source of combustion.



Fig. 17. Controlling and utilization of *Kirinyuh* (*Chromolaena Odorata*) weeds by local communities around the National Park as a fuel for biomass stoves.

IV. CONCLUSION

The conclusion of the sustainable development planning concept in the Kelimutu National Park can be described in more detail into four strategies. First, local community-based social development planning. Society is placed as the main subject of development planning. The process of building ideas and aspirations in tourism area planning needs to involve local communities to share their ideas, opinions and aspirations. The communities are invited to have ownership and interest in all development programs planned and will be carried out for the development of tourist areas in their environment. Every policy of developing regulations, facilities or infrastructure involves elements of the communities. The local communities themselves will later in the initiative participate in maintaining the results of development because they have sense of belonging and is in accordance with the need of the community.

The second approach is the sustainable economic development planning of local communities. Structural eradication of poverty in various fields with community empowerment strategy. Local communities around the Kelimutu National Park are expected to increase their income and expand employment opportunities in the tourism sector, local culture and community craft. Development priorities also prioritize basic needs of the communities such as the availability of clean water, affordable energy, decent settlements, availability of health facilities and educational facilities and infrastructure. With the fulfillment of basic needs, the main prerequisites for moving towards a prosperous society are adequate. The development carried out at present is planned to have sustainability for future generations. The pattern of community production and consumption is also expected to be developed to sustain sustainability. Ecotourism development is one that can be relied upon to improve the economy and empower the economic independence of local communities.

The third approach is rescuing and protecting the ecosystem. Kelimutu National Park area has charming natural beauty and needs to be preserved. By involving community participation, the local community around the Kelimutu National Park will be the main guardians of the ecosystem. The Ende District Government and the Kelimutu National Park Office need to provide understanding to the people in the tourist areas that preserving nature means maintaining the survival and economy of the local community. When the ecosystem is damaged, tourists will decline or even disappear. Forest ecosystem protection also provides a forest environment that is always beautiful, sustainable and charming. This condition will always be sought by tourists who come.

The final result is a formulation that is expected to be sustainable development concept for the ecological and cultural preservation of the Lio indigenous people in the Kelimutu National Park, Ende, Flores. The study able to be developed into a proposal for the Regional Government of Ende, Nusa Tenggara Timur in formulating regulations for natural sustainability and the indigenous peoples welfare around the Kelimutu National Park.

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