
Research Article

Harmonious Co-Existence between Nature and Mankind: An Investigation of a *Satoyama* Development - Like Mechanism at Imbak Canyon Conservation Area (ICCA), Sabah

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Abstract

This research is a preliminary survey of *Satoyama* development-like mechanism in Kg. Imbak, Tongod, Sabah. The objectives of this research are to determine the utilization of forest source among the local community in Kg. Imbak and their community-based conservation efforts. Face to face interviews were conducted to access primary data besides observation surveys. The data gathered are from published materials such as reports and articles. Kg. Imbak consists of *Dusun Sungai* People with a total population of 796 people. Collected data were analyzed using Descriptive Analysis and SWOT analysis. Kg Imbak is approximately 19.12 km drive from Tongod District and the local community still consumes forest source for their medicinal needs, bush meat, handicraft and construction materials such as using Ironwood tree to make coffins. Based on data collected, the Internal Factor Estimate Matrix (IFEM) is 2.59 while the External Factor Estimate Matrix (EFEM) shows a total of 2.58 indicating that Kg. Imbak, Tongod has a great potential and opportunities in terms of practicing the *Satoyama* model. There are 52 strategies determined in this research by using pair wise matching SO, WO, ST and WT.

Keywords: *Satoyama*, forest utilization, *Dusun Sungai* People, SWOT analysis, traditional knowledge, a community-based conservation effort

Introduction

In early 1990, the concept of "mankind and nature are to live together" initially originated from Japanese words. It was improvised and translated to English to mean "harmonious co-existence between nature and mankind" (Iwatsuki, 2008). The concept described as "mankind and nature living together" is also known in biological terms as "symbiosis". It includes three types of phenomenon such as mutualism, commensalism and parasitism (Iwatsuki, 2008). The term "mankind" in this symbiosis concept refers to instances of humans parasitizing on nature. Therefore, if the words "symbiosis" is applied to the idea of "mankind and nature living together," it includes the concept that "mankind parasitizes nature" which describes a negative definition.

The concept of *Satoyama* is applied in societies in Japan. The first written reference to *Satoyama* is dates back to 1759. Forester Hyoemon Terauchi used the term *Satoyama* to describe the human-managed landscapes surrounding those communities. In Japan, the concept of "*mankind and nature are to live together*" can also be applied most at *Satoyama* zones of the Archipelago. The term *Satoyama* refers to a rural landscape adjacent to the *Hitozato* (villages in developed areas where people lived as local communities with agricultural fields), from which people got additional resources partly by a lifestyle based on collecting and hunting. With this understanding, the term *Satoyama* is also similar to the buffer zone of the Biosphere Reserved Area designated by UNESCO in the 1960s, which referred to a peripheral area for joining protected areas such as wildlife sanctuary with the residential area for the local community (Iwatsuki, 2008).

The *Satoyama*-like resource use such as "harmonious co-existence between nature and mankind," or secondary natural ecosystem, which is sustainable with interaction with the humans, is not unique to the Japanese society. *Satoyama* concepts are found in many places at many points of history globally, including *tagal* in Sabah, traditional *pekarangan* and *kebun-talun* in Java, etc.

Objectives of the research

1. To investigate similarities in the approach to *Satoyama* development in Imbak Canyon Conservation Area (ICCA), Sabah.
2. To determine *Satoyama* characteristics in the development of ICCA.
3. To explore the role of local community and stakeholders in the conservation and of the nature for sustainability.

Methodology

Research Site

There are many areas in Sabah involved in conservation and we selected Kg. Imbak, Tongod which is also well known as Sabah's heartland area, located approximately 260 km southeast from the capital city of Sabah, Kota Kinabalu. It takes a four hours' drive on a sealed road and continues with two hours of four-wheel drive on an unsealed road. There are 700 people of Dusun Sungai People and Murut community living at Kg. Imbak and with nature's riches and attractions.

Besides that, Kg. Imbak is a gateway to ICCA, which is also well known as one of the last frontiers of contiguous lowland forest with scenic views, high abundance of medicinal plants, and presence of nearby local communities. Kg. Imbak is only accessible by an unsealed road that cuts through it with stretches of modern ship wooden shops lined on each side.

Data Collection

The researchers conducted face-to-face interviews and field observation surveys from 28/09 - 04/10/2018. This method was chosen as it is more likely to elicit higher response rates than mail surveys (Lee & Han, 2002). Respondents aged 18 years and above are from the local community residing in Kg. Imbak, Tongod, Sabah. For this research, a qualitative data approach was used, therefore, sample sizes were ascertained in qualitative studies like in quantitative studies but not by the same means. The prevailing concept for sample size in qualitative studies is "saturation." Saturation is closely tied to a specific methodology, and the term is inconsistently applied. The researchers proposed the concept of "information power" to guide adequate sample size for this research. Information power indicates that the more information the sample holds, relevant for the actual research, the lower amount of participants is needed. Thus, the researchers suggested that the size of a sample with sufficient information power depends on (a) the aim of the research, (b) sample specificity, (c) use of established theory, (d) quality of dialogue, and (e) analysis strategy. For this research, only 15 respondents were identified and interviewed (Malterud et al., 2016).

Data Analysis

Data was collected using Descriptive Analysis and SWOT analysis. SWOT analysis, an acronym for Strengths, Weaknesses, Opportunities, and Threats, is used in many fields, especially in the business planning department (Helms et. al, 2010).

It evaluates four (4) different elements of any project that involve specifying the research's objective and able to identify both internal and external factors to achieve the goals. Internal factors will identify both strengths and weaknesses of the plan. In contrast, external factors will provide an insight on opportunities and threats presented by the environment external to the local community. Collected data were analyzed using SWOT analysis and tabulated in IFEM and EFEM tables. Knowledge and insight needed could be identified for managers to make strategic decisions and guide their organization (Grant, 2008).

Results and Discussion

Demographic Profile

The preliminary data survey collected was based on an interview with the *Jawatankuasa Kemajuan Kampung* (JKK) Kg. Imbak, Tongod that showed the total population of their community was 796 persons. The majority of the community are Dusun Sungai People, and their primary religions are Christianity and Islam. However, this survey only interviewed a few villagers due to the far distance between the base camp to Kg. Tongod and challenging road accessibility due to the rainy season in ICCA.

Table 1. Profile of respondents - Demographic

Variables	Categories	Frequency	Percentage (%)
Gender	Male	9	60%
	Female	6	40%
Age	21 > 30 years old	8	53%
	31 > 40 years old	6	40%
	41 years old & above	1	7%
Level of education	Primary	2	13%
	Secondary	9	60%
	Tertiary	4	27%
Employment status	Self-employed	2	13%
	Government sector	11	74%
	None	2	13%

N = 15 respondents = 100 percent

Table 1 shows respondents' demographic profile based on five variables stated: gender, age, level of education, employment status, and monthly income (MYR). The result shows that male respondents (60%) were higher than female respondents (40%) in terms of gender—the distributions of male and female

respondents equitably distributed in this survey. Eighty per cent of the survey was conducted at the base camp and information gathering was from the local community working as ICCA staff. The remaining 20% was completed at Kg. Imbak, Tongod.

About 93% of the respondents are aged between 21 and 40 years and 7% were above 50 years old, with the oldest respondent aged 80 years. A total of 796 persons were residing at Kg. Imbak, Tongod. Some 73% of the villagers completed their primary and secondary education, while 27% pursued their tertiary education. However, there were about three male respondents who did not complete secondary school due to the financial cost.

Female respondents (three persons) reached tertiary education level compared to male respondents (one person). Overall, most of the male and female respondents finished their primary school as Kg. Imbak, Tongod has a primary school, SK Imbak. They need to continue their secondary education at SMK Tongod, which is about 23 km from Kg. Imbak. In terms of employment, 74% of respondents work in the government sector and 13% are self-employed. One-third of the respondents are working as wildlife rangers at ICCA, while most self-employed respondents are small retailers. Overall, most of the respondents are working, and only two of the respondents are housewives.

Monthly income (individual) and household expenditure

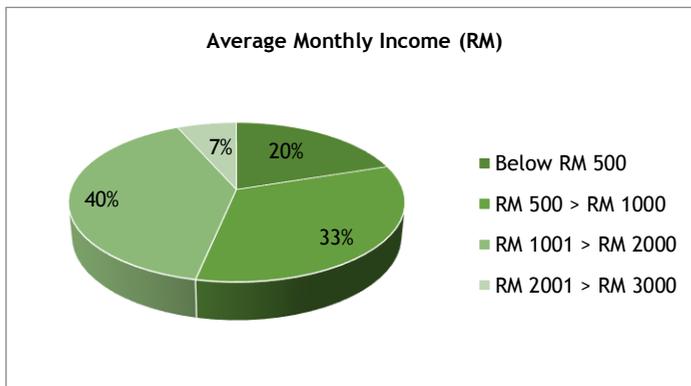


Figure 1. Percentage (%) Distribution of Respondent's Average Monthly Income (Individual)

Figure 1 above shows the percentage (%) distribution of the individual average monthly income of respondents. According to the pie chart above, each respondent has four segments of income: from below RM500 up to RM3,000 per month. The majority of respondents (46.7%) gained average monthly income between RM500 to RM1,000, while the lowest average monthly income gained by respondents consists of two categories, which are below RM500 (6.7%) and RM2,500 (6.7%) per month. There is no big difference between respondents that earned RM500 up to RM1,000 and RM1,001 up to RM2,000. As for small retailers, their average monthly incomes are between RM500 and up to RM2,000 and above. Based on an observation survey at Kg. Imbak, Tongod, there were about roughly 29 household members involved in small scale retail. Most of them sell vegetables and fish, petrol and fuel, and some own barbershops, cloth shops, bakeries, and even handicraft shops. One of the respondents was able to generate income of up to RM2,000 per month from her salted duck eggs and duck meat business.

Respondents who worked under ICCA have no financial issues when managing their household expenditure because they have permanent jobs. Overall, small scale retailers are the main economic source for the local community in Kg. Imbak, Tongod, due to the strategic location where tourists can stop to buy groceries before proceeding to the ICCA research centre.

Respondent's Source of Incomes

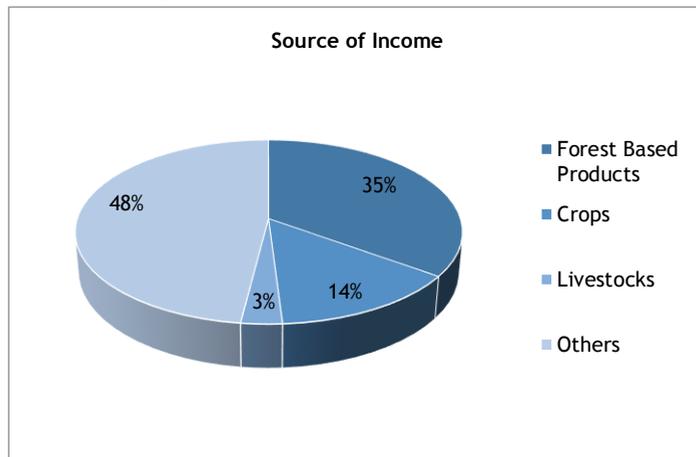


Figure 2. Percentage distribution (%) of respondent's source of income.

Figure 2 shows the percentage distribution (%) of the respondent's income sources. Four income sources were identified: from livestock, forest-based products, crops and others. Majority of the respondents have stable monthly income since almost all of them work with agencies such as government sectors. Beside working with government sectors, the data also shows that most respondents earned income from other sectors (48%), such as from homestay operations, small retailers (culinary and bakery) and part-time tourist guides during the weekend. The second highest source of income of respondents is from forest-based products (35%) followed by cash crops (14%) and livestock (3%). Forest sources such as ferns, bamboo shoots, and rattan or wild meats (deer, wild boar, and squirrel) were harvested for food and sometimes for commercial purposes (handicraft and fresh meats). Most of them said that their monthly payment (average below RM2,000) is sufficient enough to accommodate their daily needs.

Respondent's Average Monthly Expenditure

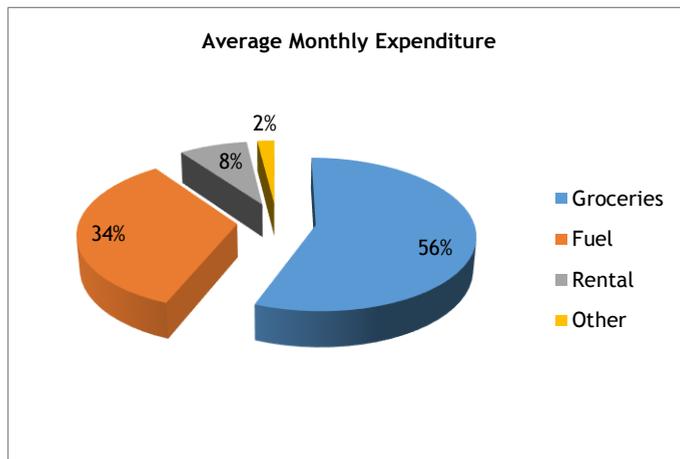


Figure 3. Average Monthly Expenditure (RM) of Respondent

Figure 3 shows the monthly expenditure (RM) breakdown of respondents. According to the pie chart above, there are four groups of expenditure made by respondent's monthly. The highest expenditure is for groceries (56%), followed by fuel (34%), room rental (8%) and other (2%) such as pocket money for school children. Groceries are essential as food stock among respondents since Kg. Imbak is located approximately 22 km from Pekan Tongod. Thus, local people tend to buy sufficient grocery stock to last them for a month. Recent research

by those concerned with consumer practises and, in particular, with shopping practises (e.g., Miller, 1998; Gregson et al., 2002; Jackson et al., 2006) argue that shopping is more than an individual act, and rather a method of making meanings and values. For instance, Miller (1998) argued that ordinary acts of shopping, such as the purchase of household food, represent and enhance long-held social values such as thrift. For Miller, the importance of thrift can only be exercised by the repetitive actions of shopping, although the final items purchased can be different for different individuals based on how they assess quality. Thus, based on Miller's belief, this also happened amongst the local community of Kg. Imbak. Local people also spend their money on fuel and petrol because some of them still use generators for electricity while fishermen have engine boats. Based from the interview, it was discovered that a majority of the respondents can still afford their expenditure as most of them have few commitments, such as house rental, electricity and water bills, compared with urban people.

SWOT Analysis

Primary data and secondary data were collected and analyzed with SWOT analysis to assess the harmonious co-existence between nature and people at ICCA and Kg. Imbak, Tongod. To determine the assigned weight, weight is assigned to each factor and the value of each weight should be between 0 and 1 (or alternatively between 10 and 100 if the 10 to 100 scale is used). Zero means the factor is not important, while one or hundred means the factor is the most influential and critical. However, the total value of all weights put together should equal 1 or 100. As for rate factors, rating is assigned to each factor, and is between 1 and 4. Rating indicates how effective the village's current strategies respond to the factor. Rating captures whether the factor represents a major threat (rating = 1), a minor threat (rating = 2), a minor opportunity (rating = 3), or a major opportunity (rating = 4). If rating scale 1 to 4 is used, then strengths must receive a 4 or 3 rating and weaknesses must receive a 1 or 2 rating. By multiplying each factor weight with its rating, a weighted score is attained (Ahmad Reza, 2011).

Table 2. Internal Factor Estimate Matrix (IFEM)

Strengths	Weight	Effectiveness Score	Final Score
Location Kg. Imbak is located on the gateway route to Imbak Falls (approximately 24 km using four wheel drive).	0.03	4	0.12
Facilities There are many retail stores (28) that sell various items, such as vegetables, gasoline, cakes, fabrics, kitchen utensils and also AGRO bank facility.	0.03	3	0.09
There is also a Ulu Kinabatangan information center where tourists can get information regarding ICCA and office for "Persatuan Porter dan Malim Kanyon Imbak", Tongod District, and a souvenir shop for local community crafts.	0.03	3	0.09
There is also a jetty on the banks of the Milian River as a facility for the Kg. Imbak using water transport such as fishermen.	0.02	3	0.06
Primary school, SK Imbak complete with water and electricity supply for the children of Kg. Imbak.	0.02	3	0.06
Natural resources As Kg. Imbak is located near forest reserve areas such as Gunung Tinkar Forest Reserve and Imbak Canyon Conservation Area, the natural resources are still abundant, such as wild boar, Belian tree, and rattan.	0.04	4	0.16
Socio-economic Small retailing, farming and agriculture such as oil palm plantation, banana farm and duck farm, are the main economic sources for the local community.	0.05	4	0.20
Culture The local community is actively involved in handicraft such as traditional rattan basket named " <i>wakid</i> ", bamboo mat and basket with high values traditional motives, <i>bubu</i> and so on.	0.04	4	0.16
Kg. Imbak is dominated by Dusun Sungai people. The community has a unique culture. As for the funeral, they use <i>Belian</i> tree for the coffin engraved with buffalo heads motive. The coffin is covered with <i>kain songket</i> and kept in a cave so that their relatives can visit the deceased.	0.06	4	0.24
School committee of SK Imbak and community also collaborated by getting involving in cultural performances.	0.06	2	0.12
Community & Organization(s) JKK is responsible for managing the village development, and they send two community members for bakery training.	0.04	4	0.16
Kg. Imbak's community organization has an on-going <i>homestay</i> project for tourists, sponsored by Petronas in collaboration with Yayasan Sabah.	0.06	4	0.16
School committee of SK Imbak is also involved in environmental education sponsored by Petronas and			

ICCA, by organizing a programme that allows students to visit ICCA as a part of their research programme.	0.04	4	0.16
Weaknesses	Weight	Effectiveness Score	Final Score
Location			
The route was gravel and only can be accessed by four-wheel drive and no public transport.	0.03	2	0.06
Facilities			
Too many similar product among the retail shop especially vegetables type cause competition among the community.	0.01	2	0.02
No updated information, especially community activities and the basic facility such as toilet and electricity, is fair but sometimes no supply.	0.04	2	0.08
The jetty is just of basic design and safety is still a factor.	0.03	2	0.06
No environmental education and the school needs more environmental awareness.	0.05	1	0.05
Natural Source(s)			
Limited usage of natural sources by local community because some of the area is under protected area.	0.04	1	0.04
Socio-economic			
Large scale of land use required for agricultural activity.	0.04	1	0.04
Culture			
Their traditional handicraft is too common in Sabah and almost every town have <i>wakid</i> , <i>bubu</i> and <i>mat</i> .	0.04	2	0.08
A coffin requires a mature <i>Belian</i> tree and the quality of the coffin is determined based on the cutting process to reduce cracks in the coffin.	0.05	1	0.05
There might be commitment issues in cultural society due to time constraints since the school reputation are evaluated through academic exam achievement.	0.02	2	0.04
Community & Organization(s)			
Limited quota for skills and training programme and only selected community members can participate in capacity building .	0.04	2	0.08
Lack of promotion since there was weak communication link between Kg. Imbak and the main town due to poor network coverage to attract tourists.	0.04	2	0.08
Presently, environmental education is not listed as core subject by the Ministry of Education and only selected students can visit and explore ICCA centre. Hence, environmental knowledge was not distributed equally among the students.	0.05	1	0.05
Total	1	-	2.59

In this research, about 13 strength factors were identified and categorized into location, facilities, natural source, socioeconomic, culture, and community organization. The weight allocated to these factors was mounted between 0.01 and 0.06 and the effectiveness score ranged between 1 and 4.

Based on Table 2, “culture” has the highest factor at 0.24. Kg. Imbak is dominated by Dusun Sungai people community and their unique culture is still preserved such as funeral culture that uses *Belian* tree (Ironwood) as the coffin engraved with buffalo head motive and covered with *kain songket* for their deceased ancestor and the coffin is kept in a place such as a cave so that their relatives can visit their deceased ancestor. The lowest weight was 0.02 while the effectiveness score ranged between 1 and 2. Thus, the final score for IFEM table was 2.59. The results are shown in Table 2.

Table 3. External Factor Estimate Matrix (EFEM)

Opportunities	Weight	Effectiveness Score	Final Score
Location			
Kg. Imbak as one of the transit points/pit stops for tourists en route to Imbak's Fall and Gunung Tinkar.	0.04	4	0.16
Facilities			
Small retailing generates direct income for local community.	0.03	4	0.12
Increase in job opportunity for the local community to operate the centre.	0.06	4	0.24
The jetty allowed community to do river cruise activity with tourist.	0.02	3	0.06
School also can be attractive when it decorated with ecofriendly landscape to increase environmental awareness.	0.04	3	0.12
Natural Source(s)			
Local community still can access and use forest sources sustainably by applying permit.	0.04	4	0.16
Socio-economic			
Increase of income generating activity by local community through agricultural industry.	0.02	4	0.08
Culture			
Product enhancement on traditional handicraft meets market demand and fashion industry to make it more classy, branded and valuable.	0.04	3	0.12
<i>Belian</i> tree is of high value and strong material for the construction and furniture building industry.	0.08	4	0.32
A great collaboration by the school committee and Kg. Imbak community so that they can preserve the "Dusun Sungai People's" traditional music and dances.	0.03	4	0.12
Community & Organization(s)			
A skillful and well-trained community is ready to venture in a new industry that affords present industry demand.	0.02	4	0.08
Local community is able to generate side income through homestay programmes and more basic facilities will be improved due to tourist demand.	0.02	3	0.06
There is increasing environmental awareness and knowledge among the young generation.	0.02	4	0.08

Threats	Weight	Effectiveness Score	Final Score
Location			
Too many vehicles on the road might cause road accidents with wildlife.	0.01	2	0.02
Facilities			
There might be an unbalanced income source among the seller depending on product types and consumer demand.	0.05	2	0.10
Increasing the number of tourists can cause traffic, and the local community is not pleased with tourists' presence.	0.01	2	0.02
When water transportation is available, wildlife's natural habitat might be disturbed with human presence and illegal hunting and poachers easily access and escape from the reserve area.	0.07	2	0.14
Operation cost and financial issue will rise to decorate and maintain the schools.	0.02	2	0.04
Natural resource(s)			
Manipulation of forest sources could happen if there is no frequent monitoring activity by the enforcement team.	0.06	1	0.06
Socio-economic			
Increasing land usage for plantations also might cause habitat loss, environmental pollution and human animal conflict.	0.05	1	0.05
Culture			
The handicraft might lose traditional identity since the design are mixed with contemporary design and increased usage of natural source such as rattan might cause extinction.	0.05	2	0.10
Unsustainable used of <i>Belian</i> tree might cause extinction since the growth rates of <i>Bellian's</i> crop to mature tree are slow. Illegal lodging of <i>Belian</i> tree also increases due to high market demand in timber industry.	0.07	1	0.07
Student activities increases and they might face overload capacity in their daily routine instead of researching.	0.05	2	0.10
Community & Organisation			
Unfair knowledge, skills and training distribution among the community members that might affect their relationship, unity and trust.	0.05	2	0.10
Increase in social problems that might affect traditional culture of local community.	0.01	2	0.02
Too many subjects in education system might cause student overload to receive input. Hence, the information and knowledge are not distributed very well.	0.04	1	0.04
Total	1	-	2.58

According to Table 3, there were about 13 factors pertaining to opportunities as well and have been categorized into location, facilities, natural resource, socioeconomic, culture and community organization. The weight allocated to these factors is between 0.01 and 0.08. Meanwhile the effectiveness scores ranged between 3 and 4. The highest weighted score for EFEM is 0.32 stating that the *Belian* tree is of high value and strong material for construction and furniture building industry. However, the lowest weighted score is 0.02 consisting three threat factors -- too many vehicles on the road that may cause road accidents with wildlife, increase in number of tourists that can cause traffic and local community are not pleased with the presence of tourists, and increase in social problems that might affect traditional culture of the local community. Ultimately, the final score was 2.58. The result of this stage is shown in Table 3. The value of internal factor equalled 2.59 in Table 2, implying that strengths were more than weaknesses. At the same time, the value for external factor in Table 3 equalled 2.58, indicating that the opportunities are also more than threats. With that, it can be said that Kg. Imbak, Tongod has great potential and opportunities in terms of practicing the *Satoyama* model.

There were about 52 strategies determined in this research by using pair wise matching SO, WO, ST and WT. The general strategies are to improve the situation analysed through SWOT and are summarized below:

- S - O strategies proposed opportunities that fit well with the village strengths.
- W - O strategies to overcome weaknesses to suggest opportunities.
- S - T strategies to identify the ways that can be used to reduce vulnerability to the external threats.
- W - T strategies to establish a defensive plan to prevent the park's weaknesses from making it highly susceptible to the external threats.

Table 4: *Satoyama* Development Mechanism Strategies

***Satoyama* Development Mechanism Strategies**

SO strategies

1. Night safari activity could be added as an ecotourism activity along the road.
2. Grouping the retailers based on products they sell to reduce competition among themselves.
3. Appointed local community to get involved in operation of the information centre.
4. Creating a Fishermen's Association Kg. Imbak to carry out river activities including carrying out jetty upgrading work.
5. Using recycled materials to create ecolandscapes around the school complete with 3R bin.
6. Increase awareness among the local community to differentiate protected species and

common species.

7. Focus on current products and invent various products (eg. *Kerepek pisang*, banana wine, banana jam) from single type of agricultural plantation such as banana trees.
8. Skill and training for local community to create contemporary product that enable consumers use it every day, such as "*barait*" and rattan sling bag.
9. The uniqueness of old *Belian* coffin and funeral site could be one of tourism destination to attract tourist and learn "*Dusun Sungai* People's" culture.
10. Encourage school participation in dance art and cultural performances at international level so that student can promote their village as well.
11. Trained community member share their skill and training with other community member to make sure the skill and training are equally distributed.
12. Any homestay programme should be recognized and certified.
13. ICCA and Petronas organized more environmental activities such as camping programme inside ICCA and students are taught how to identify tree species and other basic conservationist tasks.

WO Strategies

1. Collaborate with tour and travel agency to improve transportation issues.
2. Reducing the price of products to avoid competitions.
3. JKK and community association organize weekly activity such as sports day to unite all the villagers and their activities are well documented at the information centre.
4. Enhance the jetty with additional huts and barriers for safety purposes.
5. More posters or mural paint about environmental awareness to encourage students to conserve and preserve nature.
6. Strictly enforce permit usage to access and harvest forest resources to avoid over exploitation.
7. Apply systematic agriculture and minimize land use by using terrace farming method or rotary crops type in single plot of agricultural land.
8. Collaborate with the Malaysian Handicraft Development Cooperation to guide local community enhance their handicraft products and also product marketing.
9. Control the usage of *Belian* coffin limited to elderly deceased only.
10. Establish a village culture society that comprises various age groups instead depending too much on SK Imbak.
11. JKK plays an important role to select potential community members that have high commitment and deserve training.
12. Collaborate with Sabah Tourism Board, travel and tour agencies to promote the homestay.
13. Sabah's Ministry of Education and MOSTI (Ministry of Science, Technology and Innovation) should create School Environmental Club similar at Sarawak to encourage schools to establish *Kelab Pencinta Alam Sekitar* (PALS) to develop and pursue students interest in environmental conservation and protection.

ST Strategies

1. Create buffer zone for wildlife pedestrian along the road.
2. Revise and rebrand the current products to make it different and high market value from other village's product.
3. Tourism product and packages needs to be evaluated so that capacity for the community to accept tourist can be estimated.
4. Monitoring of river water quality every month and setting laws to penalize anyone suspected

of polluting the river.

5. Propose volunteer programme from agencies to give a talk about environmental education.
6. All stakeholders collaborate with the local community to monitor any suspicious activity such as the presence of outsiders to reduce illegal hunting and poachers.
7. Introduce organic plantation to enhance crop yield by using compost soil, organic pesticides, biological control to reduce land use and pollution.
8. Control the usage of forest use such as rattan and focus more on abundance forest source such as bamboo.
9. Creating a joint venture with Sabah Forestry Department to grow more *Belian* trees for future use.
10. Organize regular schedules for dance training and encourage participation from primary one until primary four students.
11. JKK are more active and alert with district government on community programme enhancement.
12. Establish volunteer association such as *Persatuan Rela dan Rukun Tetangga* to reduce social problems and crime.
13. ICCA and PETRONAS organize environmental and young apprentice programme during school holidays and open this to any available young generation from Kg. Imbak.

WT Strategies

1. Place more speed limit signboards along the road to prevent fatal accidents between vehicle and wildlife.
2. All community focus on one type of product and scientific studies are needed for innovation.
3. Create collaboration with tour and travel agencies to deal with tourists regarding booking and reservation.
4. Increase awareness programmes regarding river conservation, proper sanitary and waste system to reduce river pollution by humans.
5. Create budget and proposal to seek funding and monitoring report for ecoschool environment.
6. Create collaboration with local villagers in order to monitor any suspicious foreigner at every border area to reduce illegal hunting and poachers.
7. Introduce millennial farming system such as aquaponic and vertical farming to minimize land usage.
8. Develop high quality traditional handicraft made from rattan that have premium value and sell it at a high price.
9. Replace the usage of *Belian* tree with other types of wood species but maintain the design and engraved motive of the coffin.
10. Other than traditional dances performed by students, elderly local community also can perform musical performance.
11. Selection of the participant is based on member's interest and types of available programme/training.
12. Create custom local communities law such as *sogit* to reduce social problems at village level.
13. Reduce unrelated subjects and focus on environmental education at SK Imbak as this is a platform for the future generation of the local community to get involved in ecosystem conservation.

Forest usage

Kg. Imbak has both road and river access that enables goods and supplies to be easily transported in. Typically, the types of forest resources collected and used can be divided into four categories:

1. Construction material
2. Handicraft
3. Bush meat
4. Medicinal plants

a. Construction materials

Timber logs used as *Lanteng*, which means floating jetty that functions as a floating beam and acts as a float. *Lanteng* is a multipurpose hut used as a jetty, boat engine and fuel storeroom, fishing hut and as the lavatory. When operated as a lavatory, a square hole is made on the *lanteng* floor. It is tied to a tree or strong pole to avoid being washed away by the river's current or flood. *Lanteng* is no longer made of timber logs as the Petronas fund was used to build a new jetty for the local community. Meanwhile, based on the field survey and observations, most of the house structures of the local community at Kg. Imbak is made of wood-based materials, and some of the houses were semi brick and wood-based.

The Dusun Sungai people have a funeral tradition where they use *Belian* tree as a coffin for their deceased elderly people. One matured *Belian* tree (Ironwood tree) with approximate 1 m diameter can make a full coffin. Usually, to construct or rebuild houses or *Belian* coffin making, larger logs are collected from outside the village, along the periphery of the forest reserves where the mature trees occur. However, at times conflict with the Sabah Forestry Department and Yayasan Sabah can occur when villagers are deemed to have slipped into the forest reserves and logs harvested were confiscated, much to the dissatisfaction of local villagers.

b. Bush meats

Very little hunting occurs today in Kg. Imbak, as their awareness about forest conservation and protected areas has increased. However, a wild animal such as wild boar, squirrel and deer may be sought as food source when the opportunity arises.

c. Handicraft

Bamboo and rattan are collected and commonly used in the making of traps such as *bubu*, basket such as *wakid*, handicrafts and traditional tools. Presently, the

women community of Kg. Imbak engage in handicraft making and sale for tourism. They have one shop at Ulu Kinabatangan Information Centre to exhibit their handicraft and sell these as souvenirs.

d. Medicinal Plants

Medicinal herbs are from the forests, and among the more popular herbs are *Langot*, *Ambiau*, *Sangkarang* and *Topok*. Eventhough, more households today rely on access to clinics and hospitals in nearby small towns in Tongod District, medicinal herbs are still crucial for Dusun Sungai people in Kg. Imbak, especially when there is an emergency.

Community-Based Conservation Efforts

Existing Conservation Efforts

Imbak Canyon was designated a Class I (Protection) Forest Reserve in 2003 by Yayasan Sabah Group, making it a conservation area for research, education, training and recreation. It is one of four conservation areas in Sabah in addition to Tumenung Hullu and neighbouring Danum Valley and Maliau Basin. There are various grounds for the protection of ICCA including biodiversity, particularly botanical, geological including the scenic amenity associated with the site, and the neighbouring indigenous community and unique range of forest knowledge they possess which as yet remains not fully documented.

To accelerate efforts to preserve the pristine ecology of the canyon for the benefit of present and future generations, Yayasan Sabah entered into a sponsorship agreement on ICCA with Petronas, which allocated a total of RM83 million in two phases towards the preservation of the 30,000 ha ICCA (New Straits Times, 2015). The scope of funding (first phase: RM6 million) covers environmental education, community outreach and public awareness, including construction of the Ulu Kinabatangan Jetty in Kg. Imbak. Meanwhile, the second phase of the funding (RM77 million) was for the construction of the Imbak Canyon Research centre in 2013. The aim is to link the community in Kg. Imbak and researchers who were also covering Ethno-Forestry research and documentation (Daily Express, 2015). The ICCA provides facilities such as a research centre for the indigenous community in biodiversity and sustainable use of natural resources. Overall, based on the collection of secondary data, there were about four types of community-based conservation efforts (under sponsorship of Yayasan Sabah and Petronas) that have been implemented at Kg. Imbak between 2013 and 2017. These are:

1. Preservation of the traditional knowledge through traditional medicine practitioners
2. Forest knowledge through porters and guides for visitors at ICCA
3. Engagement of women involved in handicraft making
4. Environmental education for young generations under *Program Sentuhan Ilmu PETRONAS*
5. "*Homestay Po'pomponan*" through Planting Tomorrow Programme

a. Preservation of traditional knowledge through traditional medicine practitioners.

The local community has a strong bond with forest and nature. Before modernization, the local community used herb and forest plants in their traditional healing practices. The traditional healing practice of the local community was very useful in improving the pharmaceutical field through local plant identification and their usage. Thus, community outreach programme has successfully recruited at least two members of the local community (Mr. Tomas Sayang and Mr. Lokman Jawa) from Kg. Imbak to preserve their traditional healing practices. Both of them have used plants locally named *Langot*, *Ambiau*, *Sangkarang* and *Topok* for over 50 years to cure illness such as headache, cough, fever and also can be used as poison or decoration purposes (The Borneo Post, 2015). However, the interest to become traditional plant healing practitioners among the young generation is low due to easy access to nearby hospital and clinic at Tongod district. Thus, they said it was important for the younger generation to master in plant identification and conservation for future benefits especially in the medical and pharmaceutical field. This traditional knowledge has been documented and catalogued by the local community under PETRONAS and Yayasan Sabah sponsorship programme for future record.

b. Forest knowledge through porters and guides for visitor at ICCA.

Persatuan Porter dan Malim Kanyon Imbak have been established and registered under the Registrar of Societies (Jabatan Pendaftaran Pertubuhan Malaysia) since March 2017 (Yayasan Sabah, 2019) and most of the members are appointed from the Kg. Imbak's community. All porters and localized tourist guides had their licenses funded by Yayasan Sabah. Thus, the local community may be able to expand their source of income by carrying out tour and guiding activities. Most of the local tourist guides were appointed to assist tourists hiking into ICCA.

c. Engagement of women through handicraft.

Women play an important role in the local community development especially in Kg. Imbak. Recognizing the importance of women's contribution in the

development of the tourism industry in Kg. Imbak, JKK Kg. Imbak lead by Mdm. Nur Linda, has sent several women representatives from among residents of Kg. Imbak to participate in culinary skills and handicrafts in conjunction with the sponsorship programme with PETRONAS and Yayasan Sabah. According to JKK Kg. Imbak, so far two residents have managed to open their own cake shop as a result of previous culinary and bakery skills training. At the same time, the villagers are also well-versed in bamboo and rattan handicraft making such as mats, *wakid* and these handicraft products have the potential to be commercially marketed internationally as tourism products for Imbak's community.

e. Environmental education for young generations under Program Sentuhan Ilmu PETRONAS

After the ICCA was created as a premium forest reserve, Yayasan Sabah and Petronas realized that the involvement of local residents in conservation activities was crucial to ensure sustainability of the forest reserve. Dusun Sungai people also play an important role in conservation activities surrounding it. The villagers' cooperation facilitates the monitoring of forest reserves from encroachment by illegal loggers as well as poachers. Therefore, Yayasan Sabah and Petronas have organized an environmental awareness and education activity with students of SK Imbak, Tongod, known as the "*Program Sentuhan Ilmu PETRONAS*." Selected students from Primary 4 have the opportunity to carry out activities at ICCA such as the identification and classification of plants and wildlife.

f. "Homestay Po'pomponan" through Planting Tomorrow Programme

In addition, Kg. Imbak has the potential to be developed as a tourism spot due to its strategic location on the way to Imbak Canyon and Kinabatangan River. Kg. Imbak is also easily accessible to the tracking trail to Gunung Tinkar Forest Reserve which houses unique attractions (peak is exactly at the centre of Sabah) and also represents strong tourism attractions for Kg. Imbak. The starting trail for hiking at Gunung Tinkar is about 30 minutes' drive from Kg. Imbak and a hike to and from an approximately 582.4 m peak takes about six to eight hours (New Straits Times, 2017). Thus, Kg. Imbak always act as a pit stop for tourists before they continue hiking Gunung Tinkar or visiting Imbak Canyon Conservation Area. Currently, there are about 22 registered homestay operators known as "*Homestay Po'pomponan*" and have been operating since 2016 (BERNAMA, 2017). PETRONAS has funded and sponsored building materials for the homestays, and built a handicraft kiosk and gravity-fed water supply system for the local community through the Planting Tomorrow Programme with an aim to improve

the standard of living through the provision of alternative water supply solutions and livelihood enhancement activities.

Conclusion

This research examines the strengths, weaknesses, opportunities and threats of harmonious co-existence between mankind and nature between a conservation area (ICCA) and a local community (Kg. Imbak). The livelihood of the community in Kg. Imbak is fully affected by the nearby conservation area especially the Dusun Sungai people in Kg. Imbak community in terms of culture, socioeconomy and education. Overall, the local community of the Dusun Sungai people still depend on forest resources such as *Belian* tree for funeral purposes. Scientifically, *Belian* tree or *Eusideroxylon zwageri* (Ironwood) is of very high quality and is used for the construction and furniture industries (FRIM, 2014). However, this tree species is a slow growth plant and the unsustainable usage of *Belian* tree could make this species extinct. Dusun Sungai people's cultures are very unique and it gained advantage from the gazettement of the nearby forest reserves making Kg. Imbak a potential tourism site. Although forest resources extraction and utilization still occurs in the village, the potential harmonious co-existence in the research site following the *Satoyama* model was identified through SWOT analysis. The Internal Factor Estimate Matrix (IFEM) is 2.59 while the External Factor Estimate Matrix (EFEM) shows a total of 2.58 indicating that Kg. Imbak, Tongod has great potential and opportunities in terms of practicing the *Satoyama* model. There are 52 strategies determined in this research by using pair wise matching SO, WO, ST and WT that can be reviewed and implemented to ensure minimal human impact on natural resources adjacent to the conservation area.

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