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# A comparative assessment on the perceived value of Sukol river mangrove ecosystem by the local policymakers and residents of Bongabong, oriental Mindoro, Philippines utilizing multi criteria evaluation

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## ABSTRACT

Mangroves provide numerous ecosystem services for the coastal communities that surround them. They are utilized in different commercial and household usage. However, despite of mangrove contributions through their ecosystem services provision, exploitation of these tree species increase in a rapid manner. The study used the Multi Criteria Evaluation as an approach to weigh the perceived value of the individuals living near the study site regarding the use of mangroves for them. The respondents of the study were composed of two groups, the Administration level and Community level; the second group were consisted of the community people near the study site. These groups of individuals were convened for a Focus Group Discussion (FGD) in order to acquire data. Among these attributes the highest valued was the Habitat, with 98% -Very High value for the Administration level and 95% - Very High value for the Community level. Meanwhile, the lowest rating among the attributes for the Administration and Community level is the Wood Products, 84% -High value, and 89% -High value. The findings of the study provide essential discussions that describe the important role of mangroves in the coastal ecosystem, and there is a need of conservation.

Keywords: Mangrove Ecosystem Services, Sukol River, Multi Criteria Evaluation, Community Level, Administration Level

## 1. INTRODUCTION

Mangroves are known for their various ecosystem services that benefit the biotic factors inhabiting around them. Examples of these provisions are; mangroves

have pneumatophores that capture organic materials, fish spawning grounds, and buffers hurricanes and tsunamis; harbors masses of floral and faunal biodiversity. Moreover, mangroves provide variety of products in coastal settlements such as food, fuel and

building equipment, and provide indirect use value such as water filtration, coastal erosion mitigation and community storm protection [1].

However, mangroves experienced over exploitation despite of the abovementioned services that these trees delivered for humans and other living organism. Based on records, during the year 1920, the Philippines have 400,000 – 500,000 hectares of mangroves cover; thus, decrease to 120,000 hectares in 1994. Conversion of mangrove areas to agricultural lands, salt lakes, industry and settlements are the main reason of their deterioration [2]. There is a constant need to visit mangrove ecosystems for a research study, policy enhancement and implementation because of degradation done by anthropogenic activities. Globally, mangrove ecosystems are heavily threatened [3].

The idea of understanding the importance of mangrove ecosystem services for the social level can possibly provide a baseline data for their conservation. A simple evaluation of the idea of the individuals utilizing the ecosystem services of the mangroves can be a reference of their perceived value regarding these tree species.

Relative to the abovementioned scenario regarding the status of mangroves in the Philippines, the study used the Multi Criteria Evaluation to describe the extent of recognition and importance of the mangroves in terms of ecosystem services. This method helps to elicit the deeper thoughts of the participants regarding the value of the discussed ecosystem. Institutional enquiry, participant observation and discussion with local actors and group consultations are performed to decide on the values of this ecosystem based on the given attributes to be rated [4].

## **2. METHOD AND MATERIAL**

### *2.1. Research Design*

The study site was the Sukol Riverine system including mangroves and the nearby communities of Barangay Aplaya, sitio K.I. of Barangay Poblacion and sitio Asiatic of Barangay Ipil, (121.48935 E, 12.74399 N), Municipality of Bongabong, Oriental Mindoro, Philippines. The sites are riverine and intertidal in characteristic inhabited with diverse mangrove species. The water river is reaching the beach of sitio K.I. and Barangay Aplaya while sitio Asiatic is adjacent to the meander.

### *2.2. Research setting*

The study used a descriptive statistics research design through Multi Criteria Evaluation in order to process, and provide supplements for the discussion of the gathered data. This approach was used by the researcher in understanding the overall opinion of the participants in valuing the different ecosystem services of mangroves, in terms of direct and indirect use from the study site.

### *2.3. Respondents of the study*

The respondents of the study were composed of two groups, the policymakers and community people; the first group represent the Administration level of the Local Government Unit (LGU) such as the Sangguniang Bayan (SB) Members, Municipal Disaster Risk Reduction and Management Office (MDRRMO), Municipal Planning Development Office (MPDO) and Municipal Environment Office (MENRO). On the other hand, the second group were consisted of the Community level, the residents of the study site (includes residents of Sitio K.I., Poblacion, Sitio Asiatic, Ipil and Barangay Aplaya).

### *2.4. Data Collection*

The data gathering technique used in this study was Focus Group Discussion (FGD) integrating the Multi Criteria Evaluation. There were separate sets of FGD for the two groups, and these were done simultaneously. The residents' utilization of the mangrove ecosystem services were the main data to be collected during FGD; to measure their valuation regarding the worth of these saline trees. The participants were allowed to discuss their ideas freely with the others to elicit issues and information pertinent for the topic. The groups were composed of 8 to 12 people and led by a moderator in a lightly structured discussion [5].

Afterwards, the participants were given an evaluation sheet and provide their score in each attribute presented to them during the discussion. Their scores were collated to acquire the weighted average, and described using an adjective rating scale.

### 3. RESULT AND DISCUSSION

The figure 1 shows the rating provided by the respondents of the study in each attributes of mangrove ecosystem services at Sukol river

Based on the results of the study (figure 2), the Administration level (LGU Bongabong) and Community level (include Sitio K.I., Poblacion, Sitio Asiatic, Ipil and Barangay Aplaya) in a separate session agreed on the proportion of score percentage through weighted average for the following attributes of mangrove ecosystem services:

#### 3.1. Tourism Destination

In this attribute, the overall score provided by the administration level is 90%, very high value, while the community level is 88%, high value. Both of their idea regarding the importance of ecosystem as tourism destination are almost the same, thus, a two-point lead

difference are recorded based on the collated scores from the administration level. This is an implication that most of the people within the study site and managers of the area are aware of mangroves potential to provide tourism products or services. They agreed on a certain point that this ecosystem is not just about source of wood products and habitat. Furthermore, mangrove eco-tourism is developed worldwide for various activities such as boating, camping trips, and recreational fishing [6].

#### 3.2. Wood Products

The participants from the two groups have the same adjective rating scale results which High value for mangroves, as provider of wood products for household and commercial use. Thus, even they share the same adjective scale value, noticeably, that their acquired scores are different. The administration level scored 84% while the community level obtained 89%, this is a justification that at least the managers or policymakers having an understanding regarding the efficiency of mangroves as wood products such as fuel or aesthetic purposes recognize the law that protect these trees. Their score is an indication of their hesitation to agree in one of the statements of the evaluation sheet. However, the community people have 5-point lead score over the administration level, they also have understanding about the existing laws protecting the mangroves but their necessity could be the reason of harvesting the trees as wood products. They utilized the logged mangroves for commercial or household

**Table 1.** Adjective rating scale guide

Weighted Average (%)	Adjective Rating Scale
90-100	Very high value
80-89	High value
70-79	Fair
60-69	Low value
59-below	Very low value

consumption. In some part of the globe, even in the Philippines, coastal households enticed utilized mangroves for commercial charcoal, wood fuel, the bark of mangrove are extracted for medicine, and some are used for wood decorative [7].

### 3.3. Marine Commodities

In terms of utilizing the mangrove area to collect or harvest marine commodities such as fishes, mollusks, shrimps and crabs, the administration level and community level both achieved an adjective rating scale of Very High value, 90% and 93% respectively. The results of the score shows that the people in the municipality where the study site is located regardless of their social status are consuming marine products from the mangrove ecosystem. They recognize the importance of mangrove in harboring marine animals that can be utilized for consumption. These trees were known for their biodiversity reputation because most of the marine animals including the terrestrial organism dwell in the mangrove ecosystem for food, breeding and protection [8].

### 3.4. Source of Income

Based on the result shown in Fig. 2, the community level obtains a 95% score which is considered very high value in the scale guide. The people living near the study site are dependent to the commodities provided by the mangroves. They utilized the different products harvested from this ecosystem for commercial use. They might sell or trade the commodities they obtain to other people. This scenario justifies the importance of mangroves for these individuals as source of income. Meanwhile, the administration level has achieved a score of 85% which is High value based on the adjective rating scale. These group of people understood the importance of mangroves for the people living near the

Sukol River, Bongabong, Oriental Mindoro. Since, most of them are working in the different offices of the LGU much of their perception regarding the benefits from the mangrove area are for the people near the study site. Maybe this influence their score which is 85% for considering mangroves as source of income, thus, they are professionals working in the government. However, they still provide their idea regarding the income generation provided by the mangroves for other individuals that profits on this ecosystem. For example, the pole/charcoal production in Matang Mangrove Forest Reserve in Indonesia profit at least 1,467.90 to 4,403.53 USD for six months [9].

### 3.5. Nature Spirituality, Wellness and Relaxation

The Administration level and Community level have acquired a Very High value adjective rating scale in assessing the provision of mangroves in terms of nature spirituality, wellness and relaxation, 97% and 94% respectively. These results are due to the beautiful scenery, fresh air and humid atmosphere that the mangroves of the study site provide. Their senses react positively as they passed or stay for an hour in the mangrove ecosystem of Sukol river. The psycho

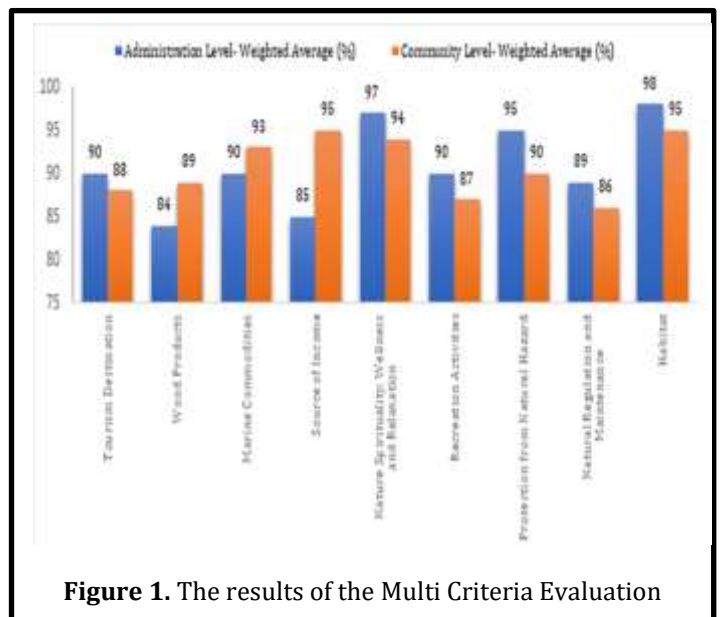


Figure 1. The results of the Multi Criteria Evaluation

response of the people upon witnessing a picturesque made them appreciate the aesthetic the nature rendered for humans. This could be the reason that the participants set a very high score for this attribute. Mangroves have customary values such as in Hindus which they utilize undisturbed mangrove forest for spiritual welfare [10].

### *3.6. Recreation Activities*

Recreation activities are usually offered through the tourism services. Today, different recreation activity is integrated in the eco-tourism industry. Most of the activities are patronized by the people working in the office or private employment. Considering the job description of the participants from the administration level the abovementioned idea could be the reason these individuals scored 90% for this attribute. Their status and social role regarding the benefits of recreation along the mangrove ecosystem seems to be necessary for them. This type of environment provides them pleasure unlike the utilization of the resident living near the area. Most of them take mangroves as source of income than leisure, this can be an explanation of their acquired score of 87% which is classified as high value in the adjective rating scale [6].

### *3.7. Protection from Natural Hazard*

The participants from the Administration level and Community level acknowledged the importance of mangrove ecosystem in reducing the impact of disaster as both group scored 95% and 90%, respectively. They set the adjective rating scale to Very High value, an indication of their knowledge and experience that these mangroves have the capacities to safeguard the coastal zone from the devastating typhoon, flooding, tsunami and strong wind. Their understanding regarding the role of mangroves in the DRR program made these

individuals to provide a high score for this item. This is an implication that every individual in the society regardless of their social status are aware of the importance of mangroves in times of natural hazards [10].

### *3.8. Natural Regulation and Maintenance*

The administration level and community level have acquired the scale rating which is High value, 89% and 86% correspondingly. Based on their score given to this attribute, they have knowledge in the regulation and maintenance by the mangroves for the welfare of itself and the surrounding biophysical factors. They have understanding that mangroves filter organic materials, release oxygen, prevent coastal erosion and sequester carbon dioxide. In this portion, the implication is that maybe the participants are not well versed regarding these environmental processes as reflected to the score given for this attribute. There is hesitation regarding the certainty of their learned information from different resources, thus, at least they acquire knowledge concerning this kind of mangrove ecological role [10].

### *3.9. Habitat*

Among the attributes of the Multi Criteria Evaluation for mangrove ecosystem services related to disaster risk reduction, habitat as one of the featured roles of mangroves bagged scores more than any of the items being rated for valuing. The Administration level acquired 98% and Community level has 95%, both of the groups considered the mangrove ecosystem with Very High value rating. They attained such scores and acceptance because these individuals involved in the evaluation have awareness that mangrove ecosystem is shelter of different marine and terrestrial animals. The range of the score they provide is an indication of their

education in the capacities and importance of mangroves in the coastal environment [10].

#### 4. CONCLUSION

The study justifies the value of mangroves in a shared manner, essential for relevant presentation of their significant role in the coastal zone covering biotic and abiotic factors. The findings can be useful to consider mangroves in the prioritization of conservation projects, and further research studies.

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#### 6. CONFLICT OF INTEREST

The authors have declared that there is no conflict of interest.

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NA

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