

# Mangrove Ecotourism Development on Kakaralamo Island North Halmahera: *Community perception, participation and development strategies*

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**Abstract.** Kakaralamo is one of small islands cluster at Tobelo, North Halmahera, Indonesia. Kakaralamo also a famous local tourist destinations, with white sandy beaches. There was one village there, namely Kakara. It was also an Indigenous village, which steeped in culture of Hi bualamo. Moreover, there also a mangrove ecosystem that due to errors in management has been degraded. This research aims to develop the potential of mangrove ecosystems in supporting ecotourism activities on Kakaralamo, seeking to determine the feasibility of the mangrove ecosystem as an ecotourism, and to know perception and participation of the local communities for mangroves ecotourism development on Kakaralamo. We analyze the socio-economic, accessibility, as well as descriptive-qualitative analysis to determine the perception and participation of the community. Based on the results before (part 1), physically Kakaralamo could support Ecotourism, where the calculation of Tourism Feasibility Index (TFI) based on the identification of seven parameters at three stations, reached 90%. Meanwhile, the results of the analysis of perception and public participation related to tourism development on the island mangrove Kakaralamo showed positive results reached 63.78%, which means that the public supports such efforts. Seven directions and development strategies formulated for it. There are (1) encourage regional governments to make detailed spatial plan of coastal and small islands in North Halmahera, (2) improve the quality of human resources to manage the potential of mangrove ecotourism, (3) increasing active participation of the community in community-based management of mangrove ecotourism, (4) socialization of legislation and law enforcement related to the protection of natural resources, including mangroves, (5) protection and rehabilitation of mangrove ecosystems and associated biota in it and formulate alternative livelihoods for communities to reduce the rate of destruction of mangrove forests by the community, (6) develop an integrated mangrove ecotourism development plan on Kakaralamo, and (7) conduct information sessions for the community to preserve the mangrove ecosystem.

**Keywords:** Ecotourism, mangroves, Kakaralamo island, North Halmahera

## 1. Introduction

Mangroves have important functions and benefits for land and sea. Physically, mangrove acts as a wave damper and storm wind, protects from abrasion, mud retention and sediment traps, dampens or neutralizes salinity increases, deposits mud so that mangrove land can grow out, and prevent and protect from coastal erosion threats [1],[2],[3]. Biologically, mangrove acts as a nursery ground, feeding ground and spawning ground of various species of fish, shrimp and other types of marine biota, producing large amounts of detritus from leaves and branches of mangroves [1]. The wood from the mangrove tree itself is a precious production [4]. While economically, mangrove is a source of fuel and buildings, land for fisheries and agriculture as well as providing foodstuffs, charcoal making, tanners (tannins), home furnishings, construction materials, medicines and as materials for the paper industry [2],[5]. In addition, one of the social functions of mangrove is as a tourist attraction [6]. In the mangrove ecosystem, there are various types of associated fauna such as birds, snakes,

primates, fish, shrimp and mollusks as well as the associate epiphytic plants such as orchids. Tourism activities can be developing it and that improve the well-being of coastal communities in general.

North Halmahera is one of the regency on Halmahera Island, North Maluku, with an area of  $\pm 22.507,32\text{km}^2$  covering  $17.555,71\text{km}^2$  sea areas (78%) and a land area  $4.951,61\text{km}^2$  (22%). This regency boundaries with Morotai at north, East Halmahera and Halmahera Sea at east, West Halmahera at south and west. North Halmahera has the nature potential in small islands, forests, beaches, lakes, rivers, hot springs, and there are several historical heritage and culture, as a tourism potential and attraction [7].

Kakaralamo island was one of the tourism potential that can be developed is Kakaralamo Island. It is one of the local tourist destinations, famous for its white sandy beaches. Kakara village located on the island is also an indigenous village steeped in culture of Hibualamo. In addition, the island also include mangrove ecosystem, which an error in its management caused degradation of mangrove ecosystem. The people of Kakaralamo have a good understanding of the existence and utilization of mangrove [8]. In addition, [8] also proposed some strategies, such as mangrove spatial zoning, community-based management and protection, and rehabilitation of some damage area in the mangrove forests. However, a study conducted still common, so we need a further study on the utilization of mangrove on Kakaralamo Island, especially for ecotourism attraction.

At the part one of this research, mangrove eco-tourism feasibility analysis was conduct. The method requires an analysis of the ecological criteria, include mangrove thickness, mangrove density and mangrove species, oceanography criteria include tidal, and biotic objects associated with mangrove forests [9]. Physically, Kakaralamo can support the ecotourism attraction, where the result of Tourism Feasibility Index (TFI) calculation based on identification to seven parameters at three stations shows the TFI reached 90% [10].

This research aims to analyze the potential of ecotourism in Kakaralamo Island. In particular, it was to analyze perception and participation of Kakaralamo community and to formulating the strategies for mangrove ecotourism development.

## 2. Method

This research was conducted in Kakaralamo Island, which is geographically located at  $1^{\circ}44'47''\text{S}$  and  $128^{\circ}02'56''\text{E}$ . There is just one village in Kakaralamo Island i.e. Kakara village as part of Tobelo District, North Halmahera Regency. Kakaralamo is about 5 km in the east of Tobelo, the capital of North Halmahera Regency, which approximately 15 minutes using *Katinting* (a small type capacity engine boat). Administratively, Kakaralamo bordering with Rorangane Island at north, Tagalaya Island at south, Kumo Island at west, and Pawole Island at east.

Data is collected using questionnaires, interviews and focus group discussions. Those were use to analyze the level of community perception and participation in mangrove ecotourism development on Kakaralamo Island, using Likert scale while participation is a descriptive analysis.

Based on data from the village monograph covering population, education level of the population, and livelihoods and infrastructure supporting ecotourism activities, and then analyzed using SWOT. We was expected to identify internal and external factors that affecting mangrove ecotourism development efforts on Kakaralamo, so it can be formulated appropriate strategies in mangrove ecotourism development on Kakaralamo.

## 3. Results and discussion

Geographically, Kakaralamo located at  $1^{\circ}44'47''\text{S}$  and  $128^{\circ}02'56''\text{E}$ . This island has an area of  $\pm 350$  ha with a width of 500 meters and a length of 1500 meters and has a flat area. Kakara Village is only one village at the island, which included in the sub district of Tobelo, North Halmahera. Kakaralamo located approximately 5 km to the east city Tobelo, which approximately 15 minutes using *Katinting* (small capacity engine boat). Administratively, Kakaralamo bordered by Roranganeisland at north, Tagalaya island at south, Kumo Island at west, and Pawole island at east.

Kakaralamo Island situated at an altitude of 0-25 meters above sea level and slope of the land

ranges between 0-10percent with a tendency to decline/tilt toward the south. The sloping conditions require a more careful arrangement [11].

The topography of Kakara village was lower mainland and the islands villagers. A temperature in this region varies greatly between 24°C to 35°C. The soil type is Andisol with properties in the thick solum air and bright yellow, brighter deeper, silt clay loam texture with clay content less than 30%. Andisol soil sensitivity to erosion is high enough, the acidity assortment and low organic matter [3].

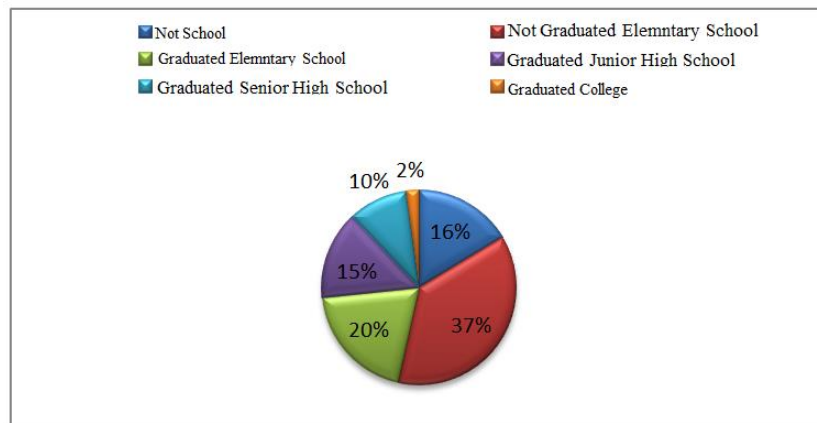
The population of Kakara village based on the statistical data in 2014 was 844 with a 223 families, consisting of 425 men and 419 women. On average, every family consists of five members of the family.

**Table 1.** Total Population by Age and Sex [11]

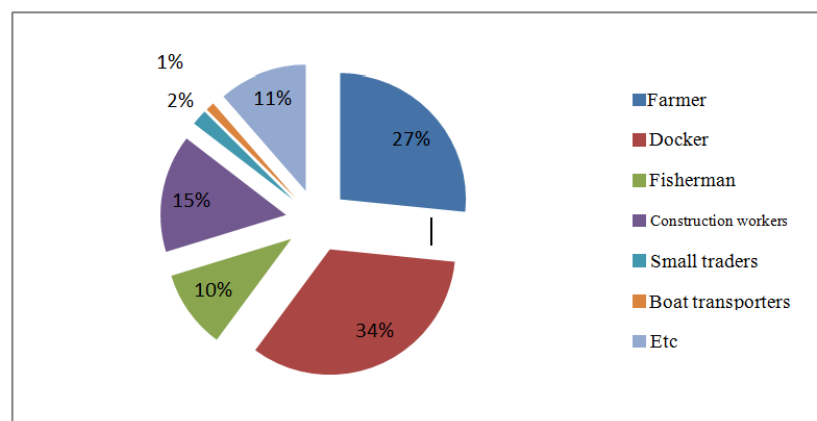
| <b>Age group<br/>(years)</b> | <b>Men</b> | <b>Woman</b> | <b>Total</b> |
|------------------------------|------------|--------------|--------------|
| 0 – 4                        | 45         | 39           | 84           |
| 5- 9                         | 68         | 50           | 118          |
| 10 – 14                      | 55         | 40           | 95           |
| 15 – 19                      | 40         | 40           | 80           |
| 20 – 24                      | 40         | 45           | 85           |
| 25 – 29                      | 50         | 45           | 95           |
| 30 – 39                      | 47         | 50           | 97           |
| 40 – 49                      | 40         | 50           | 90           |
| 50 – 59                      | 25         | 35           | 60           |
| > 60                         | 15         | 25           | 40           |
| <b>Jumlah</b>                | <b>425</b> | <b>419</b>   | <b>844</b>   |

The population of the study area can be classified by age group and gender, can be seen in Table 1. From table 1, it can be seen that about 60% of the population is a productive age group 20-59, 35% are children-teenagers group, while 5% are the elderly. Benchmark the quality of human resources in an area can be seen from the level of education of the population. Human resources can be enhanced if education can be implemented properly, it will require a means of both formal and informal education. Education should be a tiered implementation of kindergarten, elementary school junior high school, senior high school and college level. The education level of people in Kakara can be described on Figure 1.

Based on the figure 1 above, most of the population (170 people) Kakara village, do not take off the elementary school (SD). While only a small number of village residents Kakara Island (10 people) who graduated from college. Along with the development of science and technology at the moment, if we look at the level of education in the village Kakara, it is still necessary to increase the level of education, are not limited to junior high school, but to a higher level. This is because the level of education that both the technology can be controlled and people's lives can be improved. A livelihood is the main source of income for someone in a wage or salary to make ends meet. There are several types of livelihoods depend on the skills of each person. Villagers Kakara generally have a livelihood, as depicted in Figure 2.



**Figure 1.** Education level of people in the village Kakara



**Figure 2.** Livelihoods of Kakara's People [11]

From Figure 2, it seems that 34% of the villagers of Kakara livelihood as a docker (265), farmers 27%, and 15% as construction workers. This shows that most of the villagers work outside the island, and is not associated with mangrove resources that exist on the island. While the people who worked as angler only 10%, which need to be sure as well, which is associated with the mangrove ecosystem.

### 3.1. Community perception of mangrove ecotourism development

Coastal communities are people who have an active role in determining good and bad of a life of coastal ecosystem. In this study, for the measurement of public perception in the development of mangrove ecotourism on Kakaralamo, used a number of questions directed to respondents, to determine the extent of the public perception of efforts to develop mangrove ecotourism on Kakaralamo, then analyzed using the Likert Scale, as contained in the table 2. Likert scale is the scale used to measure perceptions, attitudes or opinions of a person or group about a social event or phenomenon, based on the operational definition set by the researcher. This scale is a psychometric scale commonly applied in the questionnaire in the form of survey in descriptive research [12].

The following criteria can be use to assess the community perceptions:

- If the third quartile <Score <Maximum; means very positive
- If the Median <Score <Quartile III; is positive
- If the Quartile I <Score <Median; is negative
- If the Minimum <Score <Quartile I; means very negative

In percentages, the level of public perception calculated by the following formula:

$$Perception = \frac{score}{maximalscore} \times 100\%$$

Total scores for each respondent

|              |      |               |
|--------------|------|---------------|
| Maximum      | = 30 | (5 x 6 items) |
| Minimal      | = 6  | (1 x 6 items) |
| Median       | = 18 | (3 x 6 items) |
| Quartile I   | = 12 | (2 x 6 items) |
| Quartile III | = 24 | (4 x 6 items) |

Total scores for all respondents

|              |       |           |
|--------------|-------|-----------|
| Maximum      | = 900 | (30 x 30) |
| Minimal      | = 180 | (30 x 6)  |
| Median       | = 540 | (30 x 18) |
| Quartile I   | = 360 | (30 x 12) |
| Quartile III | = 720 | (30 x 24) |

**Table 2.** Analysis of Community Perception on Mangrove Ecosystem in Kakaralamo

| Respondent   | Item |   |   |   |   |   | Total | Respondent | Item |   |   |   |   |   | Total      |
|--------------|------|---|---|---|---|---|-------|------------|------|---|---|---|---|---|------------|
|              | 1    | 2 | 3 | 4 | 5 | 6 |       |            | 1    | 2 | 3 | 4 | 5 | 6 |            |
| 1            | 4    | 3 | 4 | 5 | 2 | 5 | 23    | 16         | 4    | 1 | 3 | 1 | 2 | 3 | 14         |
| 2            | 5    | 4 | 1 | 3 | 2 | 3 | 18    | 17         | 3    | 5 | 5 | 3 | 4 | 2 | 22         |
| 3            | 3    | 3 | 3 | 4 | 3 | 1 | 17    | 18         | 4    | 2 | 3 | 4 | 5 | 3 | 21         |
| 4            | 4    | 4 | 3 | 2 | 4 | 3 | 20    | 19         | 4    | 3 | 5 | 3 | 5 | 5 | 25         |
| 5            | 3    | 2 | 4 | 5 | 1 | 4 | 19    | 20         | 3    | 1 | 2 | 4 | 4 | 2 | 16         |
| 6            | 5    | 3 | 3 | 2 | 1 | 2 | 16    | 21         | 4    | 3 | 5 | 2 | 4 | 3 | 21         |
| 7            | 4    | 3 | 4 | 2 | 4 | 5 | 22    | 22         | 2    | 2 | 3 | 4 | 4 | 1 | 16         |
| 8            | 3    | 1 | 5 | 2 | 4 | 4 | 19    | 23         | 4    | 1 | 3 | 1 | 4 | 4 | 17         |
| 9            | 5    | 2 | 3 | 5 | 4 | 4 | 23    | 24         | 3    | 3 | 2 | 4 | 4 | 4 | 20         |
| 10           | 3    | 2 | 2 | 3 | 1 | 3 | 14    | 25         | 4    | 2 | 5 | 3 | 5 | 5 | 24         |
| 11           | 3    | 1 | 4 | 2 | 4 | 2 | 16    | 26         | 2    | 3 | 2 | 2 | 2 | 1 | 12         |
| 12           | 4    | 2 | 3 | 5 | 2 | 4 | 20    | 27         | 3    | 3 | 4 | 5 | 5 | 2 | 22         |
| 13           | 3    | 2 | 5 | 1 | 4 | 4 | 19    | 28         | 1    | 2 | 5 | 5 | 4 | 4 | 21         |
| 14           | 4    | 3 | 4 | 4 | 4 | 4 | 23    | 29         | 3    | 3 | 2 | 2 | 4 | 3 | 17         |
| 15           | 2    | 1 | 5 | 5 | 3 | 4 | 20    | 30         | 3    | 2 | 1 | 2 | 4 | 5 | 17         |
| <b>Total</b> |      |   |   |   |   |   |       |            |      |   |   |   |   |   | <b>574</b> |

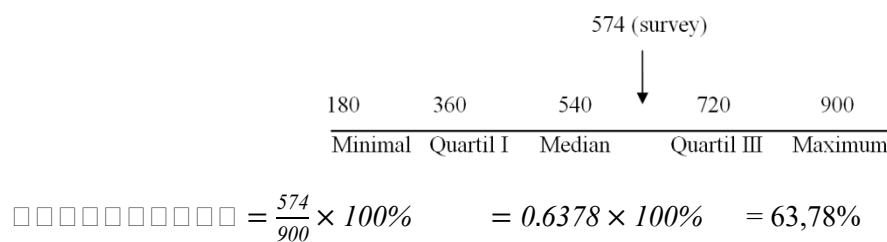
Interpretations of the number of these scores are as follows:

The third quartile <Score <Maximum, mean very positive (people were very understanding about the role of mangrove ecosystems)

Median <Score <Quartile III, is positive (the public adequately understand the role of mangrove ecosystems)

Quartile I <Score <Median, mean negative (lack of awareness about the role of mangrove ecosystems)

Minimal <Score <quartile I, means very negative (people do not understand the role of mangrove ecosystems)



The results showed that the total score for all respondents was 574, or 63.78%, and is located between the median and the third quartile, which is positive. Thus, Kakaralamo community understands the importance of the mangrove ecotourism development on the island.

### 3.2. Community participation on mangrove ecotourism development

Utilization of mangrove ecosystems is an act of direct physical participation. Forms of utilization of mangrove ecosystems carried Kakaralamo Island communities are a fishing areas and cultivation as well as utilize it as firewood, building materials, boats, conversion to agriculture, settlements and ports. One form of public participation was an oversight, such as admonishing each individual community uncontrolled cutting of mangrove, and disseminate to all people who do not understand the functions and uses of mangrove ecosystems. Besides, the public has participated to preserve the mangrove ecosystem, as a form of positive action in protecting and maintaining the integrity of the mangrove ecosystem in Kakaralamo. Community participation in the conservation of mangrove ecosystems has shown to reduce the level of awareness for the use of excessive and conduct re-vegetation.

### 3.3. Analysis of the strategies of mangrove ecotourism development

Analysis for mangroves ecotourism development strategy on Kakaralamo has done using SWOT method, to identify the key internal and external factors that influence in its management, as follows:

#### 3.3.1. Internal factors:

##### a. Strengths

- Very high potential of mangrove ecology to support ecotourism
- The mangrove ecosystem has shown a positive contribution to the local economy
- The mangrove ecosystem has been maintaining ecological balance, especially as a nursery ground for fish
- Mangrove can grow easily

##### b. Weaknesses

- Lack of public awareness in conserving the mangrove ecosystem due to lack of education
- Low income from the public, due to lack of knowledge and skills
- Degradation of mangrove ecosystems as a result of sea level rise
- Lack of socialization of regulations and law enforcement

#### 3.3.2. External factors:

##### a. Opportunities:

- Mangrove is easy to cultivate
- Availability of land for planting mangrove
- Environmental carrying capacity for the growth of mangroves still good
- The Law No. 26/2007 on spatial planning

##### b. Threats

- Harvesting of mangroves for firewood or building material.
- Development of industrial estates.
- The rise in fuel prices.

- The growing expansion of housing area residents.

**Table 3.** Development strategies conduct by SWOT

| SWOT COMPONENT | INTERNAL  |   |
|----------------|---|---|
|                | <i>STRENGTHS</i>  | <i>WEAKNESSES</i>   |
|                | <ul style="list-style-type: none"> <li>- Very high potential of mangrove ecology to support ecotourism</li> <li>- The mangrove ecosystem has shown a positive contribution to the local economy</li> <li>- The mangrove ecosystem has been maintaining ecological balance, especially as a nursery ground for fish</li> <li>- Mangrove can grow easily</li> </ul> | <ul style="list-style-type: none"> <li>- Lack of public awareness in conserving the mangrove ecosystem due to lack of education</li> <li>- Low income from the public, due to lack of knowledge and skills</li> <li>- Degradation of mangrove ecosystems as a result of sea level rise</li> <li>- Lack of socialization of regulations and law enforcement</li> </ul> |
| EXTERNAL       | <i>OPPORTUNITIES</i>  | <i>W-OSTRATEGIES</i>  |
|                | <ul style="list-style-type: none"> <li>- Mangrove is easy to cultivate</li> <li>- Availability of land for planting mangrove</li> <li>- Environmental carrying capacity for the growth of mangroves still good</li> <li>- The Law No. 26/2007 on spatial planning</li> </ul>  | <ul style="list-style-type: none"> <li>3) increasing the active participation of the community to participate in community-based management of mangrove ecotourism;</li> <li>4) socialization of legislation and law enforcement related to the protection of natural resources, including mangroves;</li> </ul>  |
|                | <i>THREATS</i>  | <i>W-T STRATEGIES</i>   |
| EXTERNAL       | <i>S-T STRATEGIES</i>   | <i>W-T STRATEGIES</i>   |
|                | <ul style="list-style-type: none"> <li>5) develop an integrated management and mangrove ecotourism development plan on Kakaralamo; and</li> <li>6) conduct an information sessions for the community to preserve the mangrove ecosystem.</li> </ul>   | <ul style="list-style-type: none"> <li>7) protection and rehabilitation of mangrove ecosystems and associated biota in it and formulate alternative livelihoods for communities to reduce the rate of destruction of mangrove forests by the community;</li> </ul>  |
|                | <ul style="list-style-type: none"> <li>- Harvesting of mangroves for firewood or building material.</li> <li>- Development of industrial estates.</li> <li>- The rise in fuel prices.</li> <li>- The growing expansion of housing area residents.</li> </ul>  |   |

A good management strategy should develop through a study of the conditions and circumstances, to explore the elements of strengths, weaknesses, opportunities and threats. In addition, observing those elements which may or likely to arise in the future. Thus, the strategies are



form to be adaptable to the changes that occur over time. The identification results of opportunities, threats, strengths and weaknesses have used as a reference in formulating strategies in Kakaralamo mangrove ecotourism development. To determine the strategy in Kakaralamo based on the factual conditions, a technique that has used is to seek cross strategy of these four factors, as follows:

- S-O Strategy, which uses the strengths possessed to take the opportunity.
- S-T Strategy, which uses the strengths that to cope with the threat.
- W-O strategy, which seeks to profit from the opportunities that exist to overcome the weaknesses.
- W-T strategy, which seeks to minimize the weaknesses by avoiding threats.

Based on the technique that has used above, the strategy can be form in mangrove ecotourism development in Kakaralamo at North Halmahera, can be shown in Table 3. Thus, the directions for mangrove ecotourism development strategy in Kakaralamo are as follows:

- a) encourage regional governments to make detailed spatial plan (or RDTR) of coastal and small islands in North Halmahera, especially on the Kakaralamo;
- b) improve the quality of human resources to manage the potential of mangrove ecotourism on Kakaralamo;
- c) increasing the active participation of the community to participate in community-based management of mangrove ecotourism;
- d) socialization of legislation and law enforcement related to the protection of natural resources, including mangroves;
- e) protection and rehabilitation of mangrove ecosystems and associated biota in it and formulate alternative livelihoods for communities to reduce the rate of destruction of mangrove forests by the community;
- f) develop an integrated management and mangrove ecotourism development plan on Kakaralamo; and
- g) Conduct information sessions for the community to preserve the mangrove ecosystem.

## 5. Conclusion

Based on the foregoing, it can be concluded that the level of perception and participation for the development of mangrove ecotourism on Kakaralamo show positive results, reaching 63.78%. This means that the public strongly supports these efforts. Therefore, it has formulated seven directions and strategies for the development of mangrove ecotourism in Kakaralamo, i.e. (1) encourage regional governments to make detailed spatial plan (or RDTR) of coastal and small islands in North Halmahera, especially on the Kakaralamo; (2) improve the quality of human resources to manage the potential of mangrove ecotourism on Kakaralamo; (3) increasing the active participation of the community to participate in community-based management of mangrove ecotourism; (4) socialization of legislation and law enforcement related to the protection of natural resources, including mangroves; (5) protection and rehabilitation of mangrove ecosystems and associated biota in it and formulate alternative livelihoods for communities to reduce the rate of destruction of mangrove forests by the community; (6) develop an integrated management and mangrove ecotourism development plan on Kakaralamo; and (7) conduct information sessions for the community to preserve the mangrove ecosystem.

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