# Potential of Mangrove Ecosystems for Ecotourism based on Tourist Perceptions

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***ABSTRACT***
The potential of the mangrove ecosystem for humans can be in the form of providing economic resources, maintaining the ecological environment and providing environmental services. So it is important to study the potential for the existence of the mangrove ecosystem, the study includes the potential for coastal tourism and the social potential of the community in supporting its development efforts. Mangrove forests have aesthetic value, both from natural factors and from the life in them. Mangrove forests provide a tourist attraction that is different from other natural attractions. People's understanding of the benefits of mangrove forests as wood producers must be substituted by exploring other economic benefits. This Travel cost Method (TCM) is used to assess the economic value of Kuala Langsa coastal tourism. Through the Travel cost method, an assessment of the costs incurred by individuals who carry out tourism activities on the Kuala Langsa coast will be carried out. While the assessment based on preferences (Contingent Valuation Method) is a method used to see or measure how much the value of an item is based on someone's estimation. Contingent Valuation Method can also be considered as an approach to find out how much value someone gives to obtain an item. The economic potential of coastal tourism reaches Rp. 23,645,203,245/year. Overall the total estimated potential for the existence of the mangrove ecosystem in Kuala Langsa is Rp. 43,547,539,297/Year. To manage this potential, a conservation strategy is needed, improving the performance of traditional institutions and the existence of management institutions as they are today must be continuously strengthened. The results of the research can be used as input and consideration for decision makers in setting policies for developing the potential of mangrove forests with environmental carrying capacity.

***Keywords:*** *Ecotourism potential, Mangrove management, Coastal Management*

## 1. INTRODUCTION

Mangrove forests have aesthetic value, both from natural factors and from the life in them. Mangrove forests provide a tourist attraction that is different from other natural attractions. The characteristics of the forest, which is in the transition between land and sea, are unique in several ways. The tourists also get lessons about the environment directly from nature. Visitors can be directly involved in planting mangroves to widen the forest area. In addition, visitors usually just take a leisurely walk through the forest area or even make this area a take some pict in location. This tourism activity in addition to providing direct income for managers through the sale of entrance tickets and parking, is also able to grow the economy of the surrounding community by providing employment and business opportunities, such as opening food stalls, renting boats, and becoming tour guides.

People's understanding of the benefits of mangrove forests as wood producers must be substituted by exploring other economic benefits besides wood so as not to damage the mangrove ecosystem. The development of attention to the benefits of non-timber will also prevent or reduce illegal logging activities in mangrove forests.


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**Figure 1.** Mangroves in Kuala Langsa

## 1.1. Formulation of the problem

The Kuala Langsa mangrove forest area has the status of a protected forest distributed along the coast and watersheds. The existence of the mangove ecosystem by the local community is used as a source of livelihood in the form of fishery products and selling locations in coastal tourism areas. As a tourist spot, the potential of the mangrove ecosystem at this location is very important to know, through an assessment of direct and indirect benefits in the form of tourism economic value. Based on the description above, several problems in the management of mangrove forests in Kuala Langsa are formulated as follows:

1) High potential of the Kuala Langsa mangrove ecosystem that is not yet known by the Gouverment and the local community.
2) The strategy for managing mangrove forests in Kuala Langsa is not yet known for high and sustainable use.
3) The form of support from the Office and the local community is not yet known in the management and improvement of the mangrove forest environment in Kuala Langsa.

### *1.1.1. Research purposes*

1) Assessing the potential of coastal tourism and community efforts in the utilization of mangrove forest coastal tourism in Kuala Langsa.
2) Reviewing the mangrove forest management strategy in Kuala Langsa.

### *1.1.2. Benefits of research*

1) Provide information on fishery potential, environmental service potential and coastal tourism potential.
2) Materials for input and consideration for decision makers in setting policies for developing the potential of mangrove forests with environmental carrying capacity.
3) For researchers and universities, as a material for scientific studies in the development of knowledge about the potential of mangrove forests and their management.

## 2. RESEARCH METHODOLOGY

### 2.1. Place and time of research

This research was conducted in the Kuala Langsa mangove area (Figure 1). The research was conducted for 2 months, namely in January-February 2022. The tools used in this study were the Global positioning system (GPS), cameras, and ATK.

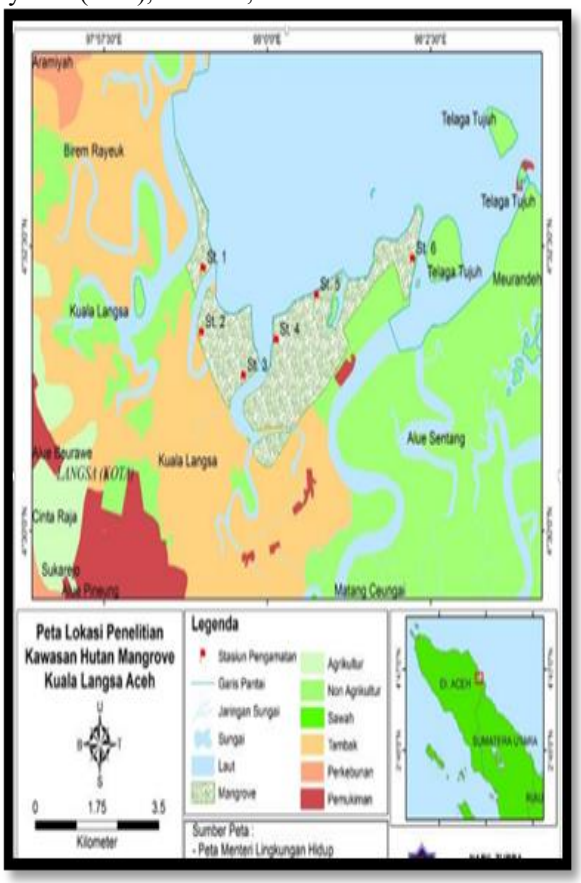


**Figure 2.** Map of the Kuala Langsa mangrove area (BAPPEDA ACEH)

#### *2.1.1 Types and Techniques of Data Collection*

For tourist data, it is carried out using the purposive method by considering the accuracy of the data and the availability of assessment criteria.

#### *2.1.2 Coastal tourism data*

In this study requires some data including travel costs, distance traveled, income, type of work, length of education, age, number of visits. Aims to determine the economic value of coastal tourism using the Travel Cost Method [1].

#### *2.1.3 Community Social Data*

Meanwhile, for community social data, several data are needed including, Willingness to Pay, Number of Visits, Travel Distance, Income, Type of Work, Length of Education, Age. aims to determine the community's assessment of an ecosystem using the Contingent Valuation Method [14].

## 3. DATA ANALYSIS

### 3.1. Analisis Travel Cost Method (TCM)

This Travel Cost Method (TCM) is used to assess the economic value of Kuala Langsa coastal tourism. Through the Travel Cost Method, an assessment of the costs incurred by individuals who carry out tourism activities on the Kuala Langsa coast will be carried out. By knowing the pattern of consumer spending, it is possible to assess the value given by consumers to natural resources and the environment [1]. The costs incurred to consume services from natural resources are used as proxies to determine the price of these resources (Fauzi 2004).

Adrianto [1] describes the TCM approach which is based on two important assumptions, namely: Assumption 1: Visitors travel with 1 goal, namely visiting a place / site in this case the Kuala Langsa coast Assumption 2: Visitors do not get certain benefits during the trip (eg benefits in the form of satisfaction of enjoying the scenery during the trip), except for the benefits when arriving at the destination (satisfaction with white sand, clean sea, etc.). If during the trip visitors also get benefits other than those from the location, then the benefits of travel and location are considered as benefits.

According to Adrianto [1] that the first stage of TCM is to estimate the number of visits based on the function of travel costs and several other factors related to the demand for visits. The following is the demand function for tourist visits:

Creating a recreation demand equation

$$\mathbf{Ln\ V = f(X1,X2,X3,X4,X5)} \quad (1)$$

Information:

V = Number of visits (times)

X1 = Average travel cost (Rp)

X2 = Distance (Km)

X3 = Income (Rp)

X4 = Work (quantified)

X5 = Education

X6 = age

The demand function is transformed

$$\mathbf{Q = \beta 0 X1^{\beta 1} X2^{\beta 2} \ldots\ldots\ldots\ldots Xn^{\beta n}} \quad (2)$$

$$LnQ = \beta 0 + \beta 1 LnX1 + \beta 2 LnX2 \ldots\ldots\ldots + LnXn$$

$$LnQ = ((\beta 0 + \beta 2(LnX2) + \ldots\ldots\ldots \beta n(LnXn) + \beta 1(LnX1)$$

$$LnQ = \beta + \beta 1 LnX1$$

### 3.2. Contingent Valuation Method Analisys (CVM)

Assessment based on preferences (Contingent Valuation Method) is a method used to see or measure how much the value of an item is based on someone's estimation. Contingent Valuation Method can also be considered as an approach to find out how much value a person gives to obtain an item (willingness to pay, WTP), FAO in Adrianto [1].

The value that will be obtained by interviewing individuals to provide a number of monetary units to be paid. In practice, respondents were interviewed directly by asking their willingness to pay for non-marketable resources. The condition of the respondent who seems to be faced with the real market when a transaction occurs is referred to as a contingent.

CVM uses WTP as a parameter for the total calculation. WTP estimation can also be done by estimating the relationship between PAPs and respondent characteristics that reflect the user's level of appreciation for the resources they have used or visited (Ln V), which can be calculated as follows:

$$\mathbf{WTP = \beta 0 + \beta 1 X1 + \beta 2 X2 + \beta 3 X3} \quad (3)$$

With :

WTP = Willingness to pay

Ln V = Number of visits (Trips per month)

X1 = Travel expense (Rp per trip)

X2 = Distance (km)

X3 = Income (Rp)

X4 = Profession (quantified: PNS; 4, private sector employee; 3, entrepreneur; 2, not yet working; 1)

X5 = Education (quantified: Magister; 4, Bachelor; 3, Student; 2, Not in school; 1)

X6 = Age (Years)

$\beta 0$ = Lowest intercept or standard

$\beta 1 \beta 2 \beta 3$ = Variable Coefficient

After knowing the level of WTP produced per individual, based on the above equation, the total economic value of resources through preferences can simply be done using the following formula:

$$\mathbf{TB = WTPi \times Pt} \quad (4)$$

With :

TB = Total Benefit

WTPi = WTP value per individual (100 responden)

Pt = Total population in year t relevant to the analysis

This CVM analysis method is used to determine the willingness to pay visitors for Kuala Langsa coastal tourism, as well as an assessment of the condition of coastal vegetation.

## 4. RESULTS AND DISCUSSION

### 4.1 General Condition of Study Area

Kuala Langsa has a mangrove area of 7,783 hectares distributed along the coast and watersheds. The existence of the mangove ecosystem by the local community is used as a source of livelihood in the form of fishery products. The area has the potential and an important role as a life support, especially for the local community. The fishery potential of the mangove ecosystem has been utilized by the local community, especially for small-scale fisheries. The potential possessed by the mangrove ecosystem in that location is very important to know, one of which is through a direct benefit assessment.

The dominant activity of residents in Kuala Langsa is fishing while the majority of tourists visiting the mangrove coastal tourism area are residents from outside Kuala Langsa who are around Langsa City and from outside Langsa City, the mangrove ecosystem also has great potential in coastal tourism activities, in addition to Recreation can also be a sector to support the economy of coastal residents by opening a culinary stall business, the Kuala Langsa mangrove forest area is included in one of the Langsa City tourism facilities [6].

Community activities are more dominant choosing to explore the road in the mangrove area and followed by culinary at the stalls around the mangrove forest and fishing in the waters near the mangroves, there are still few coastal tourism activities in Kuala Langsa because they have not collaborated with private developers, until 2021 the management of coastal tourism in Kuala Langsa is still managed separately by the Department and the community, it can be seen by the absence of a coastal tourism management agency that is a legal entity managed by the Kuala Langsa community under the supervision of the Department.

The Kuala Langsa Mangrove forest area is the largest mangrove forest in Langsa City, the village of Kuala Langsa is administratively classified in the West Langsa District, which has a mangrove forest of 83% of the total mangrove in Langsa City, East Langsa has 12% of the second largest mangrove forest because administratively it is directly adjacent to with West Langsa, so that the mangrove ecosystem is still closely related to Kuala Langsa. The LangsaBaru area has a mangrove forest area of 5% because it is bordered by eastern Langsa, while Langsa Kota and LangsaBaru have little mangrove forest area because both areas are located in the city center (Figure 2).

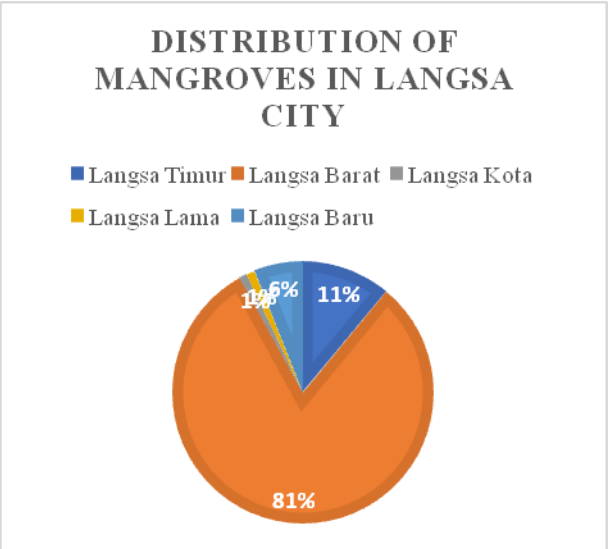


**Figure 3.** Distribution of Mangroves in Kuala Langsa.

The mangrove ecosystem in Kuala Langsa is within the local Protected Area circle. The mangrove ecosystem at the research site is a community that grows naturally. These ecosystems are generally located close to residential areas so that they have great opportunities for exploitation or utilization by local communities. Based on the function of the area, the mangrove forest which has the status as a local protected area allows it to beused by the community with the aim of supporting welfare, so there is a possibility that the area will be under pressure and the threat of damage.

### 4.2 Tourism economic valuation

#### *4.2.1 Travel cost method*

The travel cost component is the cumulative cost incurred by tourists to get to Kuala Langsa mangrove tourism. Travel costs consist of transportation costs, consumption costs, lost income during tourism activities and other costs that support tourism activities. The proportion of costs incurred by tourists of course varies, according to the tourist destination and the intended location. After being examined in more detail, there is a pattern of costs incurred by tourists at that location. Tourists incur a higher proportion of costs for consumption and transportation [1].

Based on the picture of tourists in Kuala Langsa the most (60% of respondents) spent around Rp. 25,000 for transportation and food purposes, while the minority is in the travel expense group of Rp. 50,000 that is with the number of respondents 10%. This can be seen immediately where the majority of visitors just sit and walk and buy snacks such as roasted corn and young coconuts, although only a few tourists buy heavy foods such as rice with grilled fish and crab noodles.

Yulius [15] explained that beach tourism is part of coastal tourism that utilizes beaches as a tourist attraction. Furthermore, Dahuri *et al.* [5] defines beach

tourism as recreational activities carried out around the coast such as swimming, fishing, culinary tours of typical coastal menus, walking or running along the coast, as well as enjoying the beauty of the coastal atmosphere and meditating.

**Figure 4.** Trees of Mangroves in Kuala Langsa

The multiple regression equation for the number of tourist visits (V) on several independent variables, namely perceptions of travel costs (X1), distance (X2), income (X3), occupation (X4), education (X5), age (X6), then will to see what factors influence positively and what factors negatively affect the number of visits in Kuala Langsa are as follows:

$$\text{Ln } V = 11{,}6701 - 0{,}723X1 + 0.1622X4 \quad (5)$$

Note. signs a, b indicate the significance level of the regression coefficient of each variable at = 1% and 10%, respectively.

The results of the regression of the number of visits to several independent variables indicate that the relationship is negative with travel costs, so the higher the travel costs, the lower the level of tourist visits to Kuala Langsa tourism. However, it is positively related to the level of employment, so the higher the employment level of a tourist, the higher the number of visits. Phaneuf and Smith [12] stated that the travel cost approach can be used to provide policy input. Church *et al.* [4] also stated that cultural ecosystem services will benefit the community from the aspect of protection.

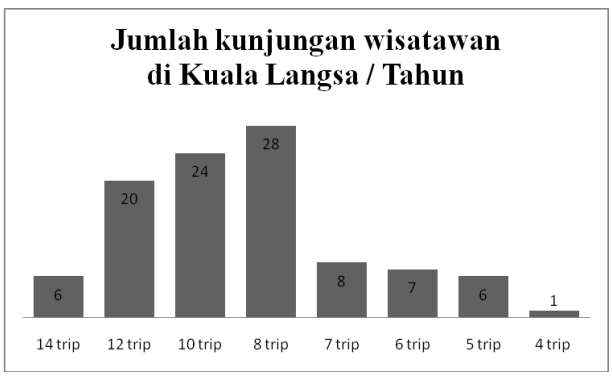


**Figure 5.** Number of tourist visits in Kuala Langsa per year

Based on the picture, it can be seen that the most trips are 8 times a year with a value of 28% of respondents while the least trips are 4 trips per year with 1% of respondents, the more complete the facilities and infrastructure and equipped with friendly services will increase the interest of tourists to frequent travel to Kuala Langsa. Zia [16] explains that the development of tourism has been able to provide various social, economic and environmental benefits in various coastal areas. The tendency of tourists to enjoy tourism in coastal areas has encouraged growth in the region, which has an impact on the increasing number of people involved in tourism activities such as improving facilities and accessibility.

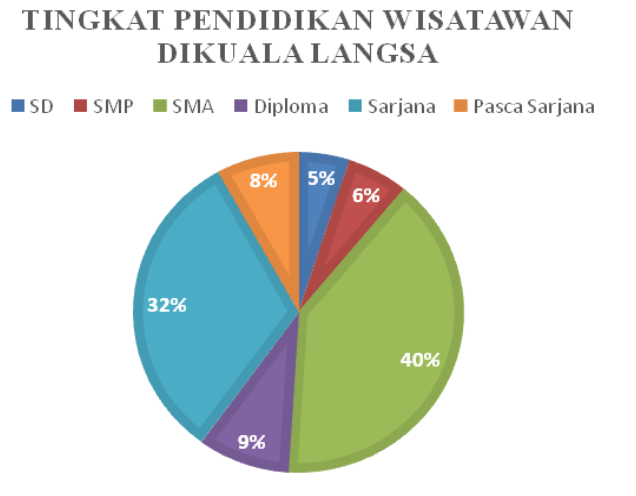


**Figure 6**. Education level of tourists in Kuala Langsa

The majority of tourists' educational backgrounds are high school graduates (49%) and undergraduate (41%) it can be concluded that the higher the educational level of tourists, the more awareness they will choose to choose educational tourist sites such as Kuala Langsa mangrove forest tourism.

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The large value of consumer surplus makes producers, the majority of whom are local residents, agree (58 respondents) to further develop the Kuala Langsa mangrove forest as a tourist spot, while those who do not agree (5 respondents) and disagree (3 respondents) want the forest in Kuala Langsa to be prioritized only for conservation only. The data is in accordance with the statement of Douvere [7] which states that a user fee system is a right for the use of the sea that is protected under a state or government legal system, which requires that entities or individuals who use the sea must pay a fee in accordance with state

regulations. This system stipulates that the sea is a state-owned asset, and all entities and individuals who intend to use the sea to carry out production and other economic activities, must pay for its use. Contingent valuation method.

The results of the valuation with the willingness of the community to pay (WTP) to improve the quality of the coastal and marine environment in the Kuala Langsa area of Rp. 125,000/Individual/Year. This value shows the willingness of tourists to keep the environment clean and coastal resources free from damage and pollution. The WTP regression equation uses several independent variables, namely perceptions of the number of visits (V), travel costs (X1), distance (X2), income (X3), occupation (X4), education (X5), age (X6). Then it will be seen what factors affect the most positively and what factors will affect negatively. The equation for the willingness to pay for the conservation fund that Kuala Langsa is paying for is as follows:

$$\text{Ln } V = -0.29982 + 0.27142aX3 + 0.22507bX2 + 0.15162bX5 \quad (6)$$

Note. signs a, b, c indicate the significance level of the regression coefficient of each variable at = 1% and 5% respectively.

Mileage and income are positively related to WTP, so the closer the distance traveled and the higher the income of tourists, the higher the willingness to pay for conservation funds. The level of education is negatively related to WTP, so the lower the level of education of tourists, the lower the willingness to pay for environmental conservation funds. Bindir *et al.* [2] and Jobstvogi *et al.* [10] explained that distance, income and education have a high influence on the amount of willingness to pay.

Protection efforts are one way to keep tourist sites sustainable, therefore the need for awareness from tourists that efforts are needed from humans themselves in the form of costs in improving the environment even though the ecosystem can improve itself [3][11]. The number of tourists from Kuala Langsa reaches 15 600 people/year, so the amount of WTP funds collected for the rehabilitation and conservation of the Kuala Langsa mangrove forest reaches Rp. 1,927,800,000. Utilization of these funds can be submitted to village-owned legal institutions that are coordinated with the tourism office to create a mangrove rehabilitation program. Such as fees for mangrove caretakers and replanting damaged mangroves and costs for making nurseries such as buying polybags and fertilizers.

### 4.2.2 Short-term plan

The priority of the short-term plan in the improvement plan chart is in the social development strategy. However, indicators from other domains that have poor conditions are one of the priorities for management improvement that must be carried out by considering the characteristics of the mangrove ecosystem resources themselves, can be seen in Table 1.

**Tabel 1.** Kuala Langsa Mangrove Ecotourism Management Strategy

| No | Strategy | Executor |
|---|---|---|
| 1 | Create a tourism management legal entity | DISPAR, Kades |
| 2 | Socialization of sustainable coastal tourism | DISPAR, Kades, BAPEDA |
| 3 | promoting tourism through online media | DISPAR |
| 4 | Create a working group for coastal tourism management | DISPAR, Kades |
| 5 | Complementing the facilities that are still lacking | DISPAR, Kades |
| 6 | Managing CVM funds for the preservation of mangrove forests | DISPAR, Kades |
| 7 | Improve coordination of each Stakeholder in the management of the Mangrove Ecosystem by holding regular meetings, as a means of communication for information dissemination and coordination | All Stake holder |

### *4.2.3 Mangrove ecosystem potential management*

Tourism management is also not optimal, between the community as managers and the service as facilitators, they do not yet have a legal entity such as KOMPEPAR (Tourism Drive Cooperative), without a legal entity, coastal tourism will be difficult to develop.Strategi Pengelolaan.

Management of the potential for coastal tourism which is quite large can be maximized with appropriate action that can immediately be taken is to create a legal entity that will be managed by the community to be able to manage mangrove tourism in an integrated manner, such as utilizing WTP from tourists for maintenance costs and planting damaged mangroves so that the number of mangroves does not decrease, legal institutions also make it easier for villages to get financial assistance from the government or foreign parties. The application of WTP can be applied in the form of an entrance ticket to the Kuala Langsa coastal tourism area, in the component of the entrance fee there must be a fee for the care and maintenance of the mangrove ecosystem to keep it sustainable.

The high total economic value means that there will be a very large opportunity for overexploitation of resources, so it is necessary to take protective measures

for the mangrove ecosystem to keep it sustainable, namely by carrying out ecosystem-based activities, meaning that every activity carried out must pay attention to the sustainability of the mangrove ecosystem, stakeholders must work together in policy making and monitoring. Ferrol-Schulte *et al.* [9] explained that the socio-ecological system in the context of coastal and marine areas in a sustainable manner is defined as a system that involves social intermediaries related to its institutions. The management of coastal and marine socio-ecological systems is carried out in an adaptive and holistic manner. Socio-ecological systems and ecosystem services have a relationship where humans are the users who take the action as well as the beneficiaries.

## 5. CONCLUSIONS AND SUGGESTION

### 5.1. Conclusion

The consumer surplus for coastal tourism is Rp. 31,346,604,211/year and the role of participation in the form of costs incurred by tourists is Rp. 1,927,800,000/year. Utilization of this high selling value potential can be applied by applying entrance tickets to tourist sites.

Mangroves in Kuala Langsa are still in the good category because the community still maintains and does not damage the mangrove ecosystem and has not been eroded due to natural disasters.

### 5.2. Suggestion

The tourism office must immediately assist and direct the community in Kuala Langsa to begin drafting the formation of a legal legal institution. In order to be able to take advantage of the results of the potential of coastal tourism. The agency is also expected to aggressively promote tourism in online and offline media, as well as add tourism facilities in order to attract more visitors.

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