

# Optimizing Client Selection for Wildlife Conservation Projects: A Comprehensive Approach Using AHP and Entropy Weighting

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**Abstract.** Illegal wildlife trade is becoming increasingly rampant. In order to select an appropriate client for wildlife conservation, a thorough analysis of the client's ability to implement our recommendations is necessary. Therefore, we use the Analytic Hierarchy Process (AHP) system to assess the alignment between the client's capabilities and the project requirements. In this paper, we develop an AHP assessment model that considers the correspondence between the client's capabilities in project implementation and the project requirements. Subsequently, we processed and evaluated the collected client data using the entropy weighting method to derive weights on six dimensions. The correspondence data was then applied to the AHP to determine the best choice based on the decision hierarchy and criteria. The combined entropy-AHP approach utilizes the strengths of both methods to make powerful data-driven decisions. Ultimately, through a series of calculations and tests, we identified the most desirable customer type as government.

**Keywords:** Entropy Weighting Method, Integrated Entropy-AHP Method, Program Delivery Capability, Client Capability Assessment.

## 1. Introduction

Currently, there is a lack of a widely accepted international methodology for assessing the suitability of project clients. However, selecting the right client is crucial for successful project implementation. Therefore, the aim of this study is to systematically assess the congruence between client capabilities and project requirements using the Analytic Hierarchy Process (AHP) and entropy weighting methods. We took into account the client's implementation capability, motivation, resource availability, authority, mobilization capacity, and responsibility, and combined these factors through the AHP model to determine the best client selection[1-2].

## 2. Client Selection Method

Currently, there is no universally accepted metric to evaluate prospective clients for projects internationally. To select appropriate clients for a project, a comprehensive analysis of the client's capacity to implement our recommendations is imperative. Therefore, we employ an analytical hierarchy process(AHP) to systematically assess the alignment between a client's capabilities and project requirements[3].

### 2.1. Establishment of the AHP evaluation model

#### 2.1.1 Evaluation model criteria

Customer assessment models for reducing illegal wildlife trade should fulfill the following requirements [4].

The assessment model is universal, combining depth and breadth, and is not constrained by different organizational forms.

The model should be comprehensive, covering all aspects of reducing illegal wildlife trade criteria for selecting clients [5-6].

The success of our clients in implementing projects depends on various factors, with execution capability being paramount. Even the most well-conceived plans can only deliver value if translated into action. Execution capability heavily influences project outcomes. Additionally, client motivation

is critical; for example, curtailing illegal wildlife trade from a law enforcement versus ecological conservation perspective engenders different levels of enthusiasm and orientation, thereby impacting project results. Other factors shaping clients' capacity to reduce illicit wildlife commerce include resources, authority, sense of responsibility, and mobilization aptitude. Analytic Hierarchy Process is shown in figure 1.

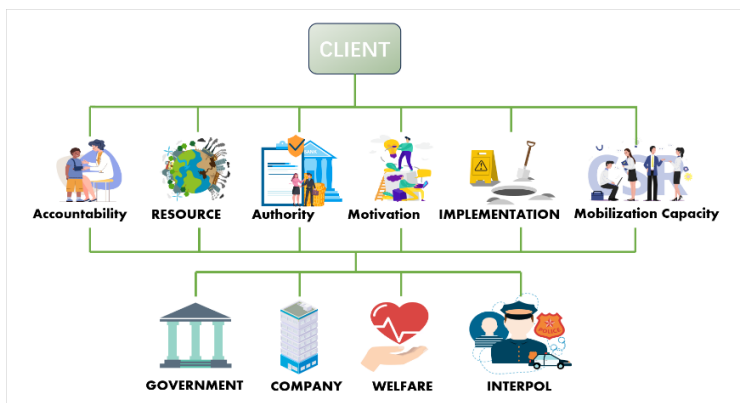


Figure 1: Analytic Hierarchy Process

▷Resource Availability

Successful realization of large-scale initiatives, such as efforts to reduce wildlife trafficking, necessitates substantial human, and financial resources. Sufficient resourcing is a prerequisite for accomplishing project objectives; without adequate assets, progress can't be made.

▷Authority

Effective enforcement and intervention measures, including anti-poaching activities, inevitably require legal jurisdiction and authoritative might. Governmental bodies may need to exert executive powers to support project goals[7].

▷Mobilization Capacity

Beyond formal authority, the ability to rally additional support is also critical. Reliance on any one group is insufficient to fulfill ambitious agendas, so outreach to expand participation is often essential.

▷Motivation

Long-term initiatives like combatting illegal wildlife trade require sustained determination over years or decades. Maintaining strong motivation and commitment is key to persevering through challenges.

▷Implementation Capabilities

Tangible expertise to execute prescribed activities is vital for translating plans into outcomes. Proficiencies should align with program requirements for success.

▷Accountability

In complex endeavors, challenges in meeting expectations are inevitable. A sense of responsibility and ownership for the project facilitates course corrections and quality control throughout implementation, enabling adaptation and learning.

Based on the above description, we developed an AHP model with six main factors.

## 2.2. Selection of client

We utilize an entropy weighting method to process and evaluate collected client data to derive weights across six dimensions. We then apply the analytical hierarchy process (AHP) with the corresponding data to compute the optimal selection. The entropy weight method enables the objective determination of index weights based on the inherent variability of indicator values. By measuring the entropy or disorder of indicator values, we can assign higher weights to dimensions with more significant variation and discrimination ability[8-9]. The derived weights are then input into the AHP, a multi-criteria decision analysis technique, to systematically assess the alternatives and identify the best choice based on the decision hierarchy and criteria[10]. The integrated entropy-

AHP approach leverages the strengths of both methods for a robust data-driven decision. and the procedure and results are as follows:

(1) Entropy weight

As there are no minimal or interval-level indicators in this question, additional homogenization of the data is unnecessary. However, given the order of magnitude and magnitude discrepancies in the data, this paper standardizes the data using the following equation to obtain the standardized matrix.

$$Z_{ij} = \frac{Z_{ij} - \min(Z_{ij})}{\max(Z_{ij}) - \min(Z_{ij})} \tag{1}$$

Variation coefficient:

$$r_i = 1 + \frac{1}{\ln(n)} \sum_{i=1}^n \frac{Z_{ij}}{\sum_{i=1}^n Z_{ij}} \ln(p_{ij}) (i = 1, 2, \dots, 6) \tag{2}$$

Weighting coefficients:

$$\omega_i = \frac{r_i}{\sum_{j=1}^6 r_j} (j = 1, 2, \dots, 6) \tag{3}$$

(2) Calculation of judgment matrix

To facilitate the calculation, We searched Google Scholar for occurrences of indicators and wildlife, when we searched Google Scholar for wildlife, we collected the mutual importance of the indicators that appeared to determine the judgment matrix.

The weight of factors:

*Implementation Capabilities > Motivation > Accountability > Authority ≈  
 Resource > Mobilization Capacity*

We have employed characters to replace a phrase, such as from instead of a resource. The relationships are shown in the table 1:

**Table 1** relationships

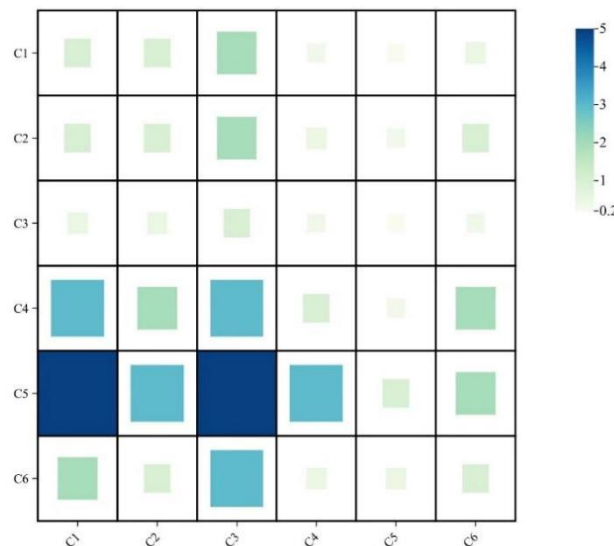
<i>Form</i>	<i>Phrase</i>	<i>Character</i>
<i>Objective</i>	Selection of customers	O
	Resource	C1
<i>Considerations</i>	Authority	C2
	Mobilization Capacity	C3
	Motivation	C4
	Implementation Capabilities	C5
	Accountability	C6
<i>Clients</i>	Government	P1
	Company	P2
	Welfare	P3
	Interpol	P4

In the determination of the judgment matrix, we adopt the approach of Saaty et al. of taking two-by-two comparisons of factors to establish a pairwise comparison matrix. That is, we take two factors  $x_i$  and  $x_j$  at a time and use  $a_{ij}$  to represent the ratio of the influence of  $x_i$  and  $x_j$  on each other. The criteria for determining the size of the value are shown in table 2:

**Table 2** materiality judgment

Scale	Meaning
1	Indicates that two factors are of equal importance compared to each other
2	Indicates that the former is slightly more important than the latter when comparing the two factors
3	Indicates that the latter is significantly more important than the former when comparing the two factors
5	Indicates that the latter is more strongly important than the former when comparing the two factors
Number less than 1	If the ratio of the importance of factor i to that of factor j is $a_{ij}$ , then ratio of the importance of factor j to that of factor i is $a_{ji} = \frac{1}{a_{ij}}$

The judgment matrix for the criterion layer is shown in Figure 2:



**Figure 2.** Criterion level judgment matrix

The judgment matrix  $A$  corresponds to the eigenvector  $\omega$  with the largest eigenvalue  $\lambda_{max}$ , which is normalized to the corresponding factor at the same level as a factor at the previous level. The ranking weight of the corresponding factor on the relative importance of a factor at the previous level is:

$$\omega = (0.0871, 0.1130, 0.0575, 0.2100, 0.3854, 0.1470)$$

The most important factor is the implementation capacity, the level of which will have a direct impact on the completion of the project since this indicator is the only one that responds to the ability to directly translate theory into reality.

(3) Consistency test

After that, we apply the largest eigenvalue  $\lambda_{max}$  for consistency Calculating the consistency Coherence indicators:

$$CI = \frac{\lambda_{max} - n}{n - 1} \tag{4}$$

Stochastic consistency indicators:

$$RI = \frac{\sum_{i=1}^n CI_i}{n} \tag{5}$$

Consistency ratio:

$$CR = \frac{CI}{RI} \tag{6}$$

The consistency index  $CI = 0.0305$  and  $CR = 0.0242 < 0.10$  were calculated and the consistency of the judgment matrix was considered acceptable.

Total hierarchical ranking is shown figure 3:

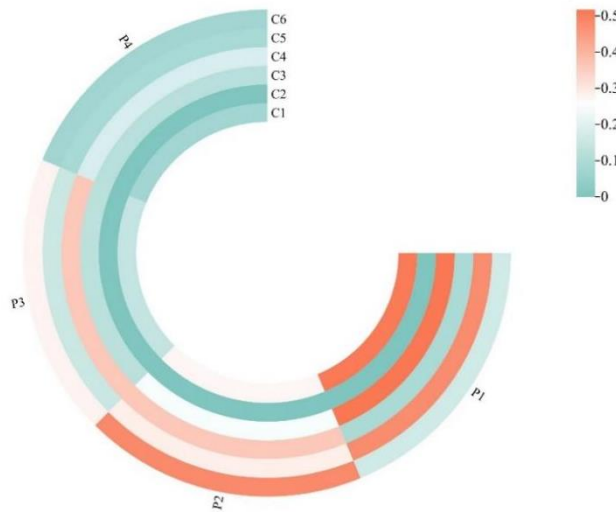


Figure 3. Hierarchical total order test

General consistency test:

$$CR = \frac{\sum_{i=1}^6 a_i CI_i}{\sum_{j=1}^6 a_j RI_j} \tag{7}$$

Since  $CR = 0.00489 < 0.1$ , the results of the hierarchical total ranking are considered to have a more satisfactory consistency and the analysis results are accepted.

**2.3. Client selection result**

After passing the consistency test, we can use the eigenvectors corresponding to the largest eigenvalues to find the weights of the main factors according to the previous.

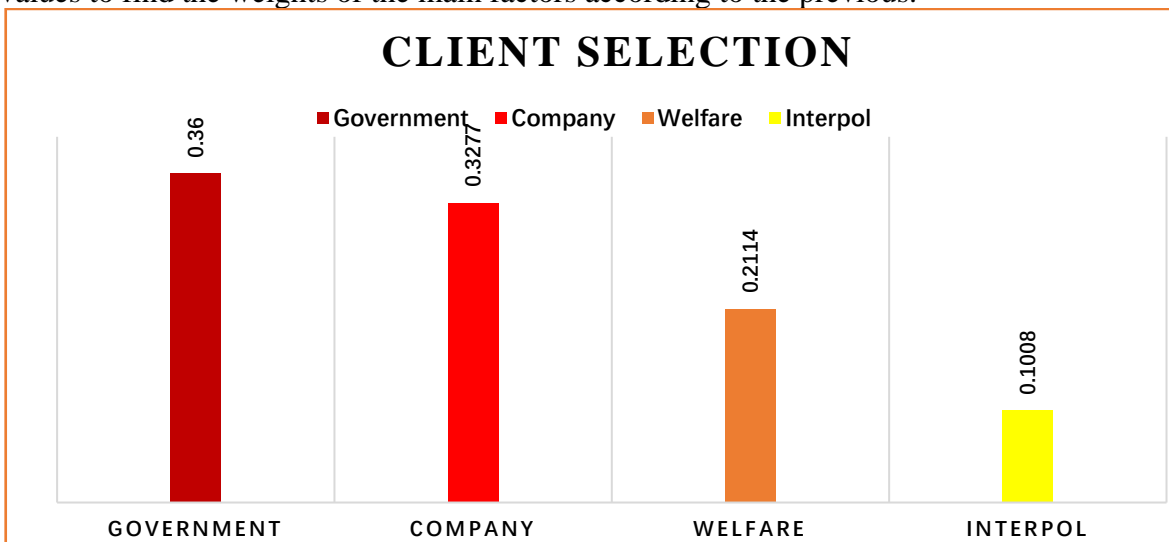


Figure 4. Client selection result

Clearly, figure 4 show that the government is our ideal client.

**3. Conclusions**

By analyzing entropy weights and the AHP methodology, we were successful in identifying the type of client best suited for the project. The government was identified as the best client choice

because of its strengths in implementation capacity, authority, and resource availability. This result provides guidance for project implementation and helps to improve the success and efficiency of the project.

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