

# *Research on National Development Strategy for Asteroid Mining Based on Analytic Hierarchy Process*

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**Abstract:** With the technological progress of outer space exploration and development, it is more and more important to pursue world equity, so this paper is helpful to put forward appropriate policies. This paper takes the rapid development of the country as the target level, the social system, science and technology, natural resources, population size, geographical location, culture and education as the criterion level, and the efficient use of natural resources, the vigorous development of social economy, the vigorous development of science and technology and the improvement of productivity as the decision-making level, and then uses AHP again. After consulting a large number of analytical documents and making and comparison, we can get the corresponding weights of each index, thus it is learned that the government first needs to solve the problem of improving science and technology to achieve efficient development, thereby reducing unnecessary investment in the process of national development, increasing income generation, and finally maximizing national interests and benefiting the masses.

## **1. Introduction**

The Outer Space Treaty was adopted on December 19th, 1966, because human beings went into outer space for unlimited exploration, and in the process, generate had unlimited prospects.[1] Whether all countries explore and utilize outer space for peaceful purposes is related to the common interests of all mankind.[2] We should also firmly believe that the exploration and utilization of outer space will benefit people of all countries after continuous development and progress, regardless of the degree of economic or scientific development of each country, as long as it is a country willing to contribute to extensive international cooperation in science and law in exploring and utilizing outer space for peaceful purposes.[3]

## **2. National Development Strategy Model Based on AHP**

We use the analytic hierarchy process (AHP)[4] because the main factors listed in the decomposition of the problem are progressive with each other.[5] Our team analyzed the factors that affect the country's development and determined each index in the hierarchical structure model diagram by consulting relevant literature, in which the target level is the country's rapid development, and the criterion level is the main factors that affect the country's rapid development: social system,

science, and technology, natural resources, population size, geographical location, culture, and education. The decision-making level consists of four indicators: Efficient use of natural resources; Vigorously develop social economy; Vigorously develop culture, education and science and technology; Improve productivity.

Our team collected a large number of literature, got the pairwise comparison judgment matrix through objective evaluation:

$$N = \begin{bmatrix} 1 & \frac{1}{4} & \frac{1}{5} & \frac{1}{6} & \frac{1}{9} & \frac{1}{11} \\ 4 & 1 & 2 & \frac{1}{4} & \frac{1}{4} & \frac{1}{8} \\ 5 & \frac{1}{2} & 1 & \frac{1}{6} & \frac{1}{8} & \frac{1}{8} \\ 6 & 4 & 6 & 1 & \frac{1}{2} & \frac{1}{6} \\ 9 & 4 & 8 & 2 & 1 & \frac{1}{3} \\ 11 & 8 & 8 & 6 & 3 & 1 \end{bmatrix} \quad (1)$$

According to the pairwise comparison judgment matrix, the feature vector and the largest feature root of the judgment matrix are obtained, which is used to show the importance of each factor at this level relative to a factor at the previous level.

$$\lambda = 6.2327 \quad (2)$$

Consistency check. Because it is necessary to prove that the weight given is reasonable.

$$CI = \frac{\lambda_{max} - n}{n - 1} \quad (3)$$

$$CR = \frac{CI}{RI} \quad (4)$$

CR= 0.0873 can be calculated. The CR value is less than 0.1, which meets the consistency requirement and the weight is valid.

Construct the contrast matrix of D to  $N_i$ :

$$N_1(\text{social system}) = \begin{bmatrix} 1 & 6 & 4 & 6 \\ \frac{1}{6} & 1 & \frac{1}{6} & \frac{1}{2} \\ \frac{1}{4} & 6 & 1 & 2 \\ \frac{1}{6} & 2 & \frac{1}{2} & 1 \end{bmatrix} \quad (5)$$

$$N_2(\text{science and technology}) = \begin{bmatrix} 1 & 5 & 8 & 3 \\ \frac{1}{5} & 1 & 2 & \frac{1}{2} \\ \frac{1}{8} & \frac{1}{2} & 1 & \frac{1}{6} \\ \frac{1}{3} & 2 & 6 & 1 \end{bmatrix} \quad (6)$$

$$N_3(\text{natural resource}) = \begin{bmatrix} 1 & 6 & 5 & 4 \\ \frac{1}{6} & 1 & \frac{1}{2} & \frac{1}{2} \\ \frac{1}{5} & 2 & 1 & \frac{1}{2} \\ \frac{1}{4} & 2 & 2 & 1 \end{bmatrix} \quad (7)$$

$$N_4(\text{population size}) = \begin{bmatrix} 1 & \frac{1}{6} & \frac{1}{8} & \frac{1}{6} \\ 6 & 1 & \frac{1}{3} & 1 \\ 8 & 3 & 1 & \frac{1}{4} \\ 6 & 1 & 4 & 1 \end{bmatrix} \quad (8)$$

$$N_5(\text{geographical position}) = \begin{bmatrix} 1 & 1 & \frac{1}{3} & \frac{1}{4} \\ 1 & 1 & \frac{1}{3} & \frac{1}{6} \\ 3 & 3 & 1 & \frac{1}{2} \\ 4 & 6 & 2 & 1 \end{bmatrix} \quad (9)$$

$$N_6(\text{cultural education}) = \begin{bmatrix} 1 & \frac{1}{2} & 2 & \frac{1}{4} \\ 2 & 1 & 5 & \frac{1}{2} \\ \frac{1}{2} & \frac{1}{5} & 1 & \frac{1}{4} \\ 4 & 2 & 4 & 1 \end{bmatrix} \quad (10)$$

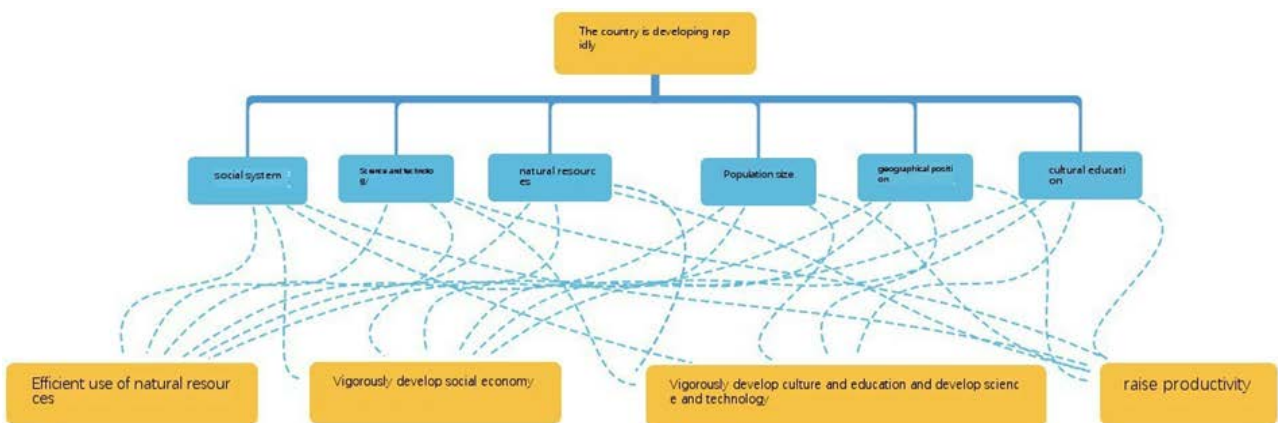


Figure 1: Model and analysis

Get the weight of each index, and the efficient use of natural resources accounts for 0.19; Vigorously develop social economy 0.25; Improve productivity accounted for 0.17; Vigorously developing culture, education and science and technology accounted for 0.39%. The calculation results are sorted according to the weight of the four indicators to maximize the interests of developing

countries, that is, vigorously developing culture and education and developing science and technology have the greatest influence.

### 3. Conclusion

"Benefit the whole mankind" is the purpose of policy promulgation and continuous changes with the changes of the times, so our index is no longer the equity of each country, but to focus on the whole mankind and maximize the benefits. Combining with the analytic hierarchy process, we know that the government first needs to solve the problem of developing cultural undertakings and improving science and technology, to reduce unnecessary investment in the process of national development, increase income, and finally maximize benefits.

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