USING AHP METHOD FOR EXPERTS PREFERENCE ANALYSIS IN RISK MANAGEMENT OF PROTECTED AREAS: A CASE STUDY IN VIETNAM

ABSTRACT

From 1990 to 2015, the World's forest resources decreased 129 million ha (FAO, 2015). Globally, deforestation has continued to increase. To respond, reliable and up to date information on the state of forest resources is essential to support decision-making for investment and policymaking in both forestry and sustainable development. Many countries have developed protected area systems as a core strategy to protect national biodiversity and environment. The World Conservation Monitoring Centre rated Vietnam as the 16th most biologically diverse country in the world. A big challenge to biodiversity conservation in Vietnam is human disturbances of local communities living in the buffer zones and surrounding. An analysis of human factors and natural hazard was carried out with integration of AHP and GIS in spatial decision-making process. A sample model was developed in order to highlight the area where have the most problem.

Keywords: AHP, GIS, protected area, risk management

1. Introduction

The Bach Ma National Park (BMNP) is a protected area legally classed as special-use forests located in central Vietnam. The national park is regarded important for the conservation of a green corridor that stretches from the Vietnam-Lao border to the East Sea. However, illegal hunting and logging are still a relatively common problem in the BMNP. Forest thieves use waterways (streams, river) as a method to transport timber outside of the park. Besides illegal activities, other risks such as erosion and tourism activities are also counted as the negative impacts to the sensitive ecosystems of the Park. The study used AHP and GIS for modelling exposure to perturbation in the BMNP.

2. Literature Review

Decisions that need support methods are difficult by definition and therefore complex to model. A trade-off between prefect modelling and usability of the model has to be achieved. Among various MCDM techniques, the Analytical Hierarchy Process (AHP) (Saaty 1980) has reached this compromise. Integrating GIS and AHP is a powerful tool, which assists analysts and decision-makers to deal with the complexity of the spatial decision-making process (Murayama and Thapa 2011; Malczewski and Rinner 2015).

3. Research Design and Model Analysis

Structured interviews with nine experts were carefully selected so that they can provide the researcher with the required knowledge and cooperation. The experts selected must have several criteria such as have more than 10 years' experience in the research field and play a role as a decision maker in the BMNP. An aggregation of all nine judgments was accomplished based on geometric mean method.

Table 1 Pair-wise comparison matrix of nine experts

Indicators	Erosion	Hydrology	Tourism activities	Illegal logging	Illegal hunting
Erosion	1	1.318	0.627	0.159	0.205
Hydrology	0.759	1	0.501	0.148	0.194
Tourism activities	1.594	1.994	1	0.324	0.511
Illegal logging	6.265	6.752	3.085	1	0.746
Illegal hunting	4.871	5.150	1.956	0.572	1
Consistency Test (CR<=10%)	Eigenvalue = 5.025 → CI = 0.006; RI = 1.11 → CR = CI/RI = 0.006				

The relative weights was calculated and showed the following result: (Erosion, Hydrology, Tourism activities, Illegal logging, Illegal hunting) = (0.073, 0.061, 0.131, 0.443, 0.292). Each of those five factors of exposure was analysis separately and then combined together with weights respectively. A hot spots model was developed with help of GIS tool (see snapshot below).
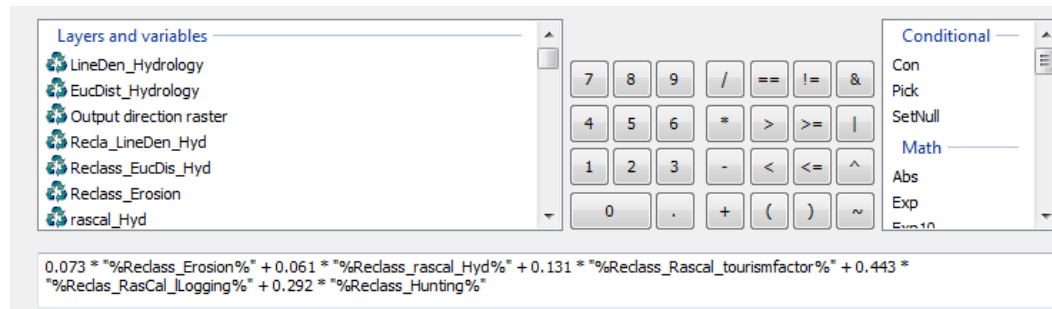
4. Conclusions and limitation

The results shown that the most risk to the BMNP are focused on the area where close to boundary in the southwest of the BMNP. However, forest rangers are limited and many parts of BMNP have difficult mountainous terrain to make survey. Hence, rangers are limited to particular fields and cannot cover all illegal activities inside the park. Therefore, not all of data could be represented spatially.

5. Key References

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