

Contribution 19 in session "Forest roads and environment"

## **Spatial Multi Criteria Decision Making for Estimating Environmental Costs of Road Management Activities**

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Conflicts between road building activity and consistently inventories protection standards of forest road structure are complex challenges to best management practices in mountain terrains. As a result, many forest managers would like to make appraise alternative construction strategies regards to environmental issues. Currently, there is a lack information available on make decision about where and when to apply alternative techniques over a mountain watershed. Tools are require to integrate multi attribute of environmental performance of the forest roads, as captured in a road inventory, into a comprehensive quantities system to provide better decisions for managing of roads network. To achieve these purposes, presented study would enjoy of a multi-criterion decision analysis tools (Analysis Hierarchy process or AHP) to identify and convert uncertainties and vagueness decision matrix of spatial multi environmental criteria of each road segment along a road network in north forest of Iran. Then, we utilize Fuzzy Analytical Hieratical Process or FAHP and Fuzzy Hierarchal Technical for Order Preference by Similarity Ideal Solution or FHTOPSIS as new approaches for ranking alternatives. Model could be identified 23 sub criteria and 17 indexes for 3 strategic criteria including road-related sediment & soil loss, road-related landslides and road-related aquatic factors. In essence, results showed that road-related sediment & soil loss factor has greater global weighted priority (0.469) than others (0.340 and 0.180, respectively,) in pairwise comparisons by forest engineers, while technical characteristics of road structures was also identified as the most important index in tackling these effects along the road network. The case study undertaken in this research successfully reaffirmed that proposed combinatorial method has a good option in vagueness conditions and ability to include a number of geospatial data and constraints to improve reliability of decision making using the intuitionistic fuzzy-based approach.