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# A Probabilistic Approach for Participatory Evaluation of Resource Management Systems

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**Abstract:** When planning resource management systems in villages, involving stakeholders in planning these systems is known to lead to better results with more success and less conflict. While planning these systems, stakeholders often need to evaluate several alternatives before selecting one which best suits their requirements. A simple multi criteria decision analysis model which they can understand, such as a linear weighted summation model, will help them in evaluating efficiency of each alternative and ranking it. While using such models, a common practice is to obtain weights of each criterion from stakeholders using methods such as analytic hierarchy process. Values of each criteria for each alternative are also obtained from stakeholders. Whenever such information is obtained from stakeholders, there will be variability among values obtained from different stakeholders. While mean or median of these multiple values can be used to evaluate point estimates for efficiency of each alternative, the variability in these values can also be propagated through the model using Monte Carlo simulation approach to compute a range of possible values and their probability distribution for efficiency of each alternative. The frequency with which one alternative is ranked better than another is used to decide the confidence with which we can say that one alternative is better than another. Current work elicits from stakeholders multiple values for each variable and associated probabilities. These values and their probability distributions are propagated through the model for generating a probability distribution for the efficiency of each alternative. While this approach might perform better than other approaches in capturing perception of stakeholders about efficiency of each system, it places extra cognitive load on the stakeholders. Current work compares performance of each approach to see which is better and if it is sufficiently better to justify the extra cognitive load on stakeholders.

**Keywords:** *Participatory Modelling; Analytic Hierarchy Process; Monte Carlo Simulation.*