

THE MULTI-CRITERIA APPROACH IN ROAD PROJECTS, EXPERIMENT OF THE CHILEAN HIGHWAYS DIRECTORATE

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1. SUMMARY

Multi-criteria assessment methods apply to the decision-making process from a multidisciplinary approach to a problem. Its introduction in project assessment complies with a well-known problem, that is taking into consideration all the criteria which should be contemplated for making an informed and sustainable decision, even if these criteria cannot be quantified.

This methodology, known in Europe, and in the United States as Multi-Criteria Decision Making Methods, (MCDM) can be applied to any project offering several possible solutions alternatives. Moreover, the Multi-Criteria Approach is used more and more in infrastructure projects, because it facilitates communication of the decision to the communities. Criteria used to comparatively assess each one of the alternatives are of economic, as well as social, urban, and environmental nature.

In Chile, it is an approach introduced experimentally in 2001 in road layout studies as an additional form to the economic and social assessment, bringing a major change in the very way of approaching the study. Our reference has been the French experience in the matter. Also, the method has been used to prioritize the projects in the annual process called "The Exploratory", which is part of any infrastructure project of the Ministry of Public Works - road projects and others.

2. KEY WORDS

MULTI-CRITERIA / FEASABILITY STUDIES / DECISION MAKING

3. MULTI-CRITERIA, DIRECTIONS FOR USE

3.1 The method

The goal of the multi-criteria assessment is to provide decision-makers with a methodological tool which allows them to make the best possible decision. The method used in Chile is the "Discreet Multi-criteria Decision", that is which keeps only a finite number of alternatives; the choice of the layout is based on a comparative assessment of the alternative's characteristics, or features according to the relevant assessment criteria that have been selected.

The method contains 2 steps:

1. The analysis
2. The assessment.

The analysis consists of defining the stakes and main points, whether they are environmental, social, economic, or political (stakeholders' strategies).

These stakes are often expressed through sets of problems, which lead to confirm and highlight the initial problem that the project should solve.

Moreover, definition of the stakes and main points form a solid basis to set up a communication strategy with the community and local stakeholders.

The assessment contains 5 steps:

- 1) Definition of assessment criteria ranked by assessment theme (Environment, Regional Development, Transport, Economic Assessment, etc.)
- 2) Validation of criteria by decision-makers.
- 3) Elaboration of the assessment grid by the technical project team from a comparative assessment of alternatives.
- 4) Choice of the alternative by decision-makers.
- 5) Communication of the decision to governmental public utilities in the region.

1) Definition of the assessment criteria:

The assessment is defined from the stakes. These criteria should fulfil at least 3 conditions:

- Exhaustiveness
- Coherence
- No duplication.

The best set of criteria is the one which presents descriptive considerations, that is which describes the problem in the best manner and which gives the most intuitive understanding to decision-makers.

2) The validation of criteria

The criteria predefined by the technical level are presented to decision-makers for their validation. Once validated, the criteria cannot be modified, unless if in the light of new information, it is necessary to integrate new criteria.

3) The comparative assessment of alternatives: the assessment grid

The comparison between alternatives uses themes including one or several criteria individually assessed. In its turn, each criteria is divided into one or several topics which reflect the technical and functional characteristics of the alternatives to assess, their physical and socio-economic impacts, as well as the possibilities of future regional and urban development that they can offer.

The rating is carried out from an singular ordinal ascending scale, varying from 1 to 5, that is from the most favourable to the least favourable. Moreover, each mark is associated to a colour (from green to red), which thus makes up the multi-criteria grid.

4) The assessment committees

The technical level makes the assessment first and sets up relevant committee meetings by theme. These committees are set up by the project manager and the specialist of the contract manager, and eventually by the specialist of the design office.

5) The weighing

In a first step, the relevant committees apply weighing factors to each topic, which are then transposed into a grid, and graphed into histograms. The topic of the same criteria is weighed, building "the grid by criteria" with the topics in ordinate and the alternatives in abscissa, as shown in the figure n°2.

In a second step, the committees define weighing factors for each criteria, leading to the "grid by theme".

Finally, the decision-makers define in an implicit or explicit way weighing factors by theme of assessment, which lead to the choice of the alternative.

3.2 Conclusion

More than an increase of the cost of the study, applying the multi-criteria approach requires on the part of the awarding authority of the study, a much deeper analysis to define the study perimeter, but it also requires a global reflection on the cohesion of the project . This approach may bring about real divergences of the goals of the project and of the elements to be taken into account in the solution to be suggested. That, far from creating a handicap for the project manager, should be seen as an opportunity to appraise, over time, the soundness of the project and the relevance of the solution chosen. The application of the method remains nevertheless at an experimental level. Its generalization requires the participation of the main agents and implies a profound change in the very manner of conducting feasibility studies, from the point of view of analysis as well as that of the transparency of the decision-making process.

Figure 1 – Definition of the Stakes

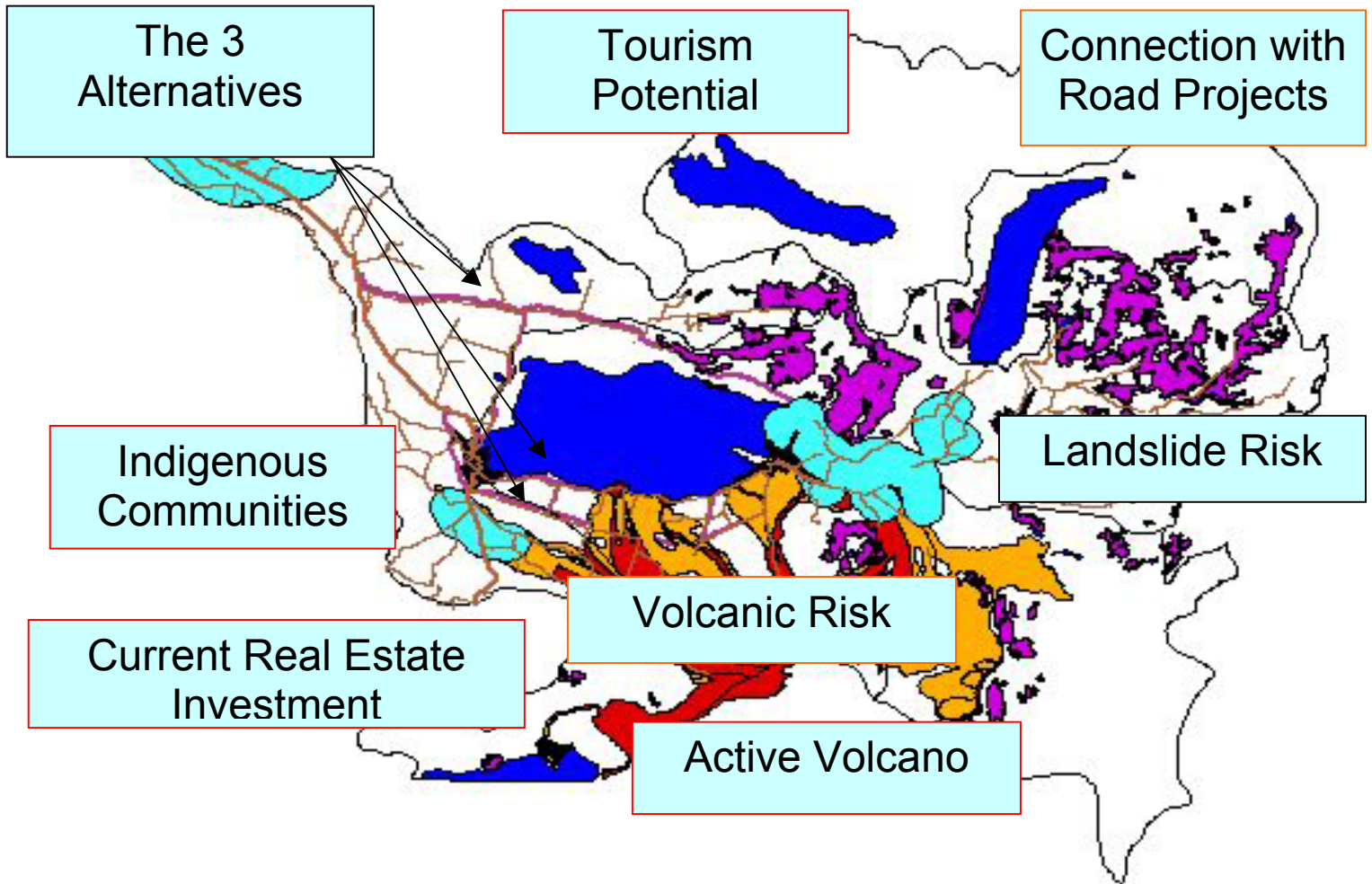


Figure 2 - Example of a multi-criteria assessment grid

THEME	CRITERION	ALTERNATIVES						
		a	b	c	d	e	f	g
TECHNICAL CONSTRAINTS	Length			Green				
	Earth moving			Yellow				
	Bridges			Red				
	Utilities network			Yellow				
	Expropriations			Yellow				
LOCAL AREAS								
	Reinforcement of the tourist attraction at a regional level.			Red				
	Development of tourist zones			Green				
	Integration of urban and rural systems			Red				
	Accessibility/ Connectivity to dynamic growth zones.			Yellow				
	Reversal of tendencies of socioeconomic segregation.			Yellow				
<i>Planning</i>	Conformity to zoning plans.	Green	Yellow	Red	Red	Yellow	Red	Green
<i>Environment</i>	Restrictions on fragile and protected natural resources			Yellow				
	Presence of scope of natural resources.			Green				
	Impact on landscape.			Red				
TRAFFIC								
	Travel time			Green				
	Use variation of Route 199-CH			Yellow				
SAFETY								
	Geometry			Yellow				
	Accident risk zones			Red				
INDICATOR								
	Total Cost			Yellow				
	Updated benefits			Yellow				
	Profitability rates			Green				
	Best year for investment			Red				

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