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Regime

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1 Introduction

Regime is a MCA qualitative method based on the possibility of partial compensation among the different criteria which affect the evaluation of the various policy alternatives. MCA qualitative methods are used when some or all data are not available in quantitative terms, and qualitative criteria and measurements must be applied. In this regard, decision makers working in government are frequently faced with circumstances where the information in the performance matrix, or about preference weights, consists of qualitative judgements. A number of methods exist to respond to this (NERA 2004) and among those, one can find the following:

- The Regime method can handle qualitative information on scores and priorities. The method provides a complete ranking and information on the relative certainty of the results (Hinloopen et al., 1983; Israels and Keller, 1986; Nijkamp et al., 1990; Janssen, 1992).
- The permutation method can handle qualitative information on scores and priorities. However, the method provides a ranking that is not necessarily complete (Paelinck, 1974, 1977; Ancot and Paelinck, 1982; Ancot, 1988).
- The evamix method has been especially designed to handle mixed qualitative/-quantitative information on scores and quantitative information on priorities. It provides a complete ranking and information on the relative qualities of the alternatives (Voogd, 1983; Nijkamp et al., 1990, Janssen, 1992).
- The expected value method can handle qualitative information on scores and priorities. The method provides a complete ranking and information on the relative differences between alternatives (Rietveld, 1980, 1984; Nijkamp et al., 1990, Janssen, 1992).

In the following lines we only focus, describe and review the Regime method.

2 Methodology

Regime is a partially compensatory method, which allows some degree of compensation among criteria. Regime is also a discrete method, that is, which compares a finite set of alternatives. It can use binary, ordinal, categorical and cardinal (ratio and interval rate), and also mixed information. Qualitative information is transformed into quantitative in order to be treated. It is a concordance analysis, meaning that it is based on pairwise comparison between alternatives according to some chosen criteria in order to establish a rank between them. It was developed by Nijkamp in 1982 (Hinloopen et al. 1983).

Regime uses as input an impact matrix and a set of weights. The first one resumes information about the various impact of the alternatives in relation to the chosen criteria. The weights express the (politically determined) relative importance of the criteria.

3 Process

First of all the impact matrix is constructed which indicates the performance of each alternative according to each of the chosen criteria. As well as Electre and Promethee, Regime is a concordance method. Pairwise comparison between the set of alternatives according to each criterion are carried out. For each pair of alternatives i and k, the criteria are selected, for which alternative i is better or equal to alternative j. We call the set of these criteria concordance set. The criteria according to which an alternative j is worse or equal to alternative i called discordance set. Then, the alternatives i and j are ranked by means of the concordance index Cij, that is, the sum of the weights attached to the criteria according to which alternative i is better or equal to alternative j. Then the concordance index Cji is calculated, which is obtained summing up the weights
of the criteria according to which alternative j is better or equal to alternative i. Finally, the net concordance index is calculated subtracting Cji from Cij (\(iij = Cij - Cji\)), which is positive if alternative i is preferred to alternative j. It must be noted that, since in most cases only ordinal information is available on the weights, but not trade-offs (we know that a criterion is most important than another one but it is not known how much of a good performance of a criterion is sufficient to compensate a bad performance of another one), the net concordance index only tells whether an alternative is preferred to another, but not how much. Since sometimes it is not possible to obtain a complete ranking of the alternatives using only iij’s sign, a performance indicator pij is formulated for the criterion i with respect to the criterion j, which indicates the probability that an alternative is preferred to another one, that is, that the net concordance index is positive: pij=\(\text{prob}(iij>0)\). Using the performance indicator, an aggregate probability index can be defined, which indicates the performance score: Next, we define an aggregate probability measure, which represents the performance score:

\[
p_i = \frac{1}{I-1} \sum_{j \neq i} p_{ij}
\]

where I is the number of chosen alternatives, pij and of pi are estimated using a specific probability distribution of the set of feasible weights. More technical information can be found in Hinlopen et al. (1983).

4 Review

4.1 Evaluation of results

Regime is a relatively easy method to use, provided that one can have access to a user-friendly software, as the one developed by the Free University of Amsterdam. It presents the same difficulties of many other MCA methods: the determination of alternatives, criteria and weights entails a high degree of subjectivity although at the same time this subjectivity can be also be made more explicit by the same implementation of the method.

Policy processes

Regime is a useful instrument to support a policy process. It offers a structure that helps to gather information on the different impacts of alternative policies. Using the software, the ranking process becomes easy. The most important difficulty is the determination of the weights, because it is very difficult to reach a consensus among the stakeholders on that and is mainly a political problem rather than a technical one.

Sustainable development aspects

Similarly to the other MCA methods (see section 2) Regime can be used to assess the sustainability of alternative policy options. In fact, the criteria used in the analysis can represent and include aspects from the three dimensions of sustainability, that is, the social, the economic and the environmental one.

Operational aspects

The cost in terms of money and of time of a MCA analysis performed with Regime analysis much depend on the kind of criteria that are chosen—which increase the need for information—and on the data availability.
Once criteria are formulated and if the software is used and the information is available to operationalise those criteria, the ranking procedure is rather quick.

### 4.2 Experiences

Regime has applied in various MCA, mostly in the Netherlands (Hinlopen et al. 2004, Kitsiou et al. 2002, Reggiani et al., 1995, Vreeker et al. 2002). It has proven to be a useful method to deal with policy choices that involve different and conflicting objectives.

### 4.3 Combinations

In the software elaborate in the Vrije Universiteit of Amsterdam (Janssen et al.), Regime is combined with the Saaty method, which is used to determine the weight set.

As many other MCA, Regime was also combined with GIS methods (see for example Kitsiou et al., 2002), which allows including in the analysis a geographical characterization.

Also, Regime can be combined with a conflict analysis and with participatory techniques.

### 4.4 Strengths and weaknesses

**Strengths of Regime**

As all MCA methods, Regime helps to structure the evaluation process and the information gathering. The most important advantage of Regime is that is can use different types of information. This flexibility is very important with real–world cases, were there is complexity and many data are not available in quantitative terms.

As all outranking methods, it is more realistic than the methods based on value functions, such as for example MAVT, because it does not reduce complexity to one single dimension.

The software makes the use of Regime user–friendly, so that it is not difficult to use for non–experts.

**Weaknesses of Regime**

As all outranking methods, Regime is less axiomatized than MAVT. Also, in the aggregation procedure, some information is lost. The establishment of the weights might be problematic, as explained before. It might noted that some level of technical expertise is required for its sound use and correct understanding.

### 6.4.5 Further work

A possible direction for further research and development of regime can be the improvement of the methodology as done for example in Hinlopen et al. (2004) with regard to the integration of ordinal and cardinal information. Also it might be interesting to combine or use simultaneously Regime with other MCA methods and integrate it with conflict analysis and participatory techniques. Finally, it might be interesting to use Regime to evaluate alternative policies and projects on a European or national level and to observe to which extent it can be combined with other tools assessed within the Sustainability A–Test project.

### 4.6 References

Hinlopen E., Nijkamp P., Rietveld P. (1983), Qualitative discrete multiple criteria choice models in regional planning, Regional Science and Urban Economics 13, pp.77.102


