Evaluation of final disposal of sites for construction and demolition waste in Mexico City

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Introduction

In Mexico, Construction is an important industry; it generates 5,6 million jobs in the total country.

Construction and Demolition Wastes (C&DW

In Mexico City there are a generation about 14.000 tons/day of C&DW [Sedema, 2019] but there is not a suitable site to dispose of these wastes

Open dumping outside Mexico City (Environmental negative impacts)

In this work a multi-criterion evaluation methodology was applied to find a suitable location of a final disposal of site of Construction and Demolition Waste (C&DW), in Mexico City.

Objetive

To analyze options to determine the suitable place for final disposal of construction and demolition waste, in Mexico City.

Materials and methods

Materials :

- Description of the study area
- Field search
- Sites evaluation

Through this method,12 sites were analyzed

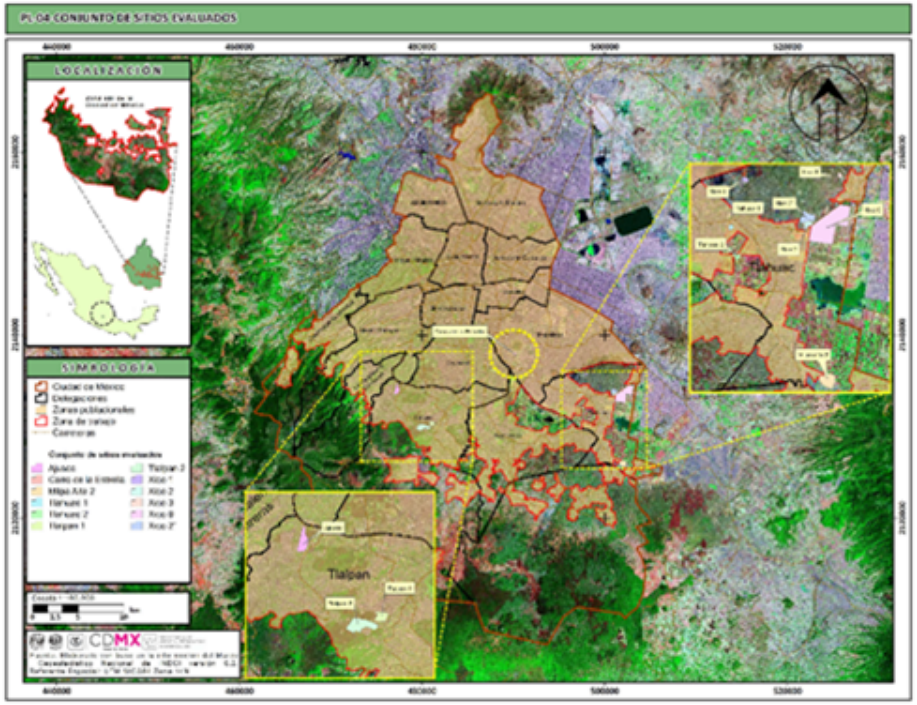
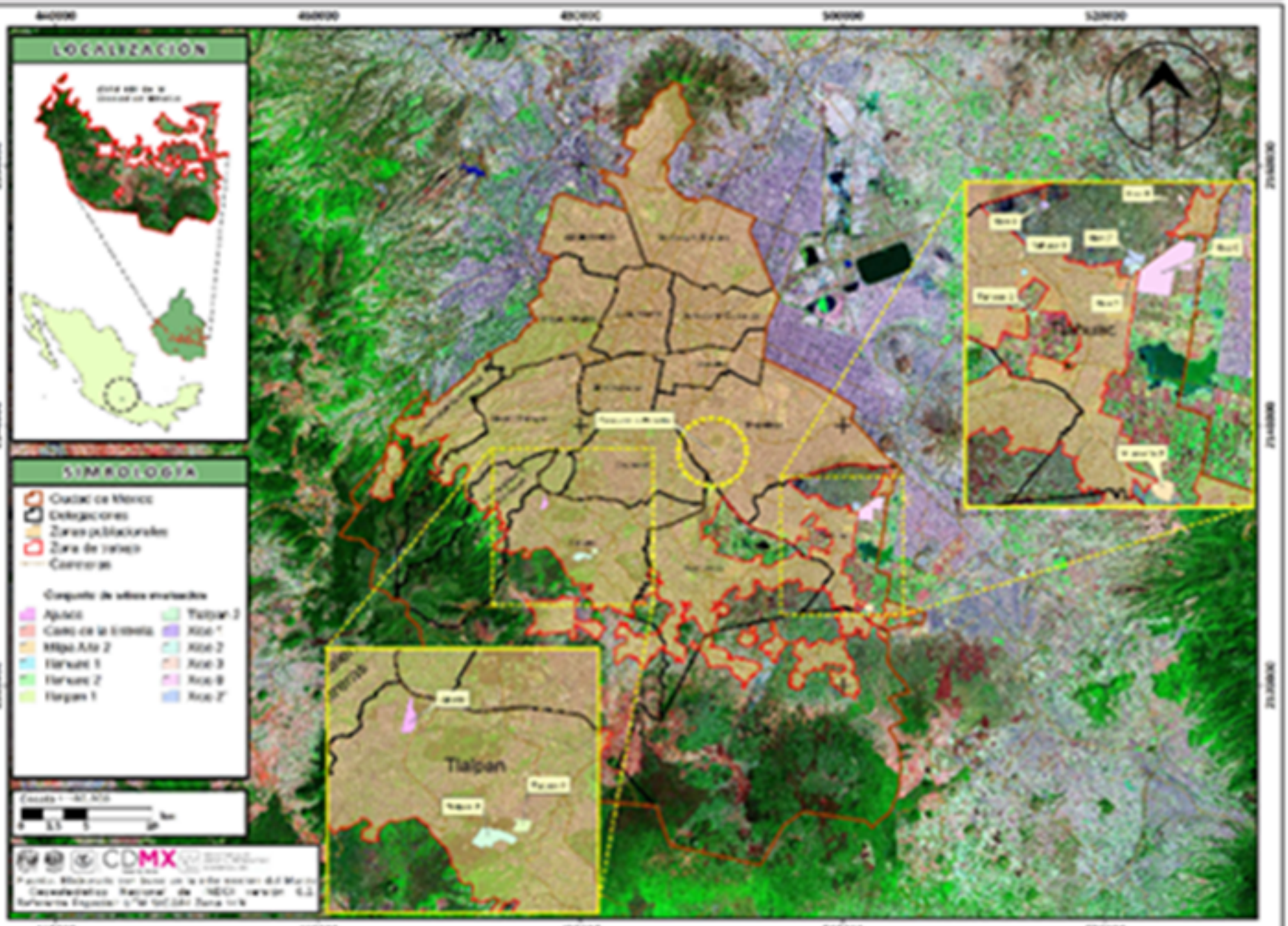


Figure 1. Preliminary delimitation of possible sites

PL 04 CONJUNTO DE SITIOS EVALUADOS



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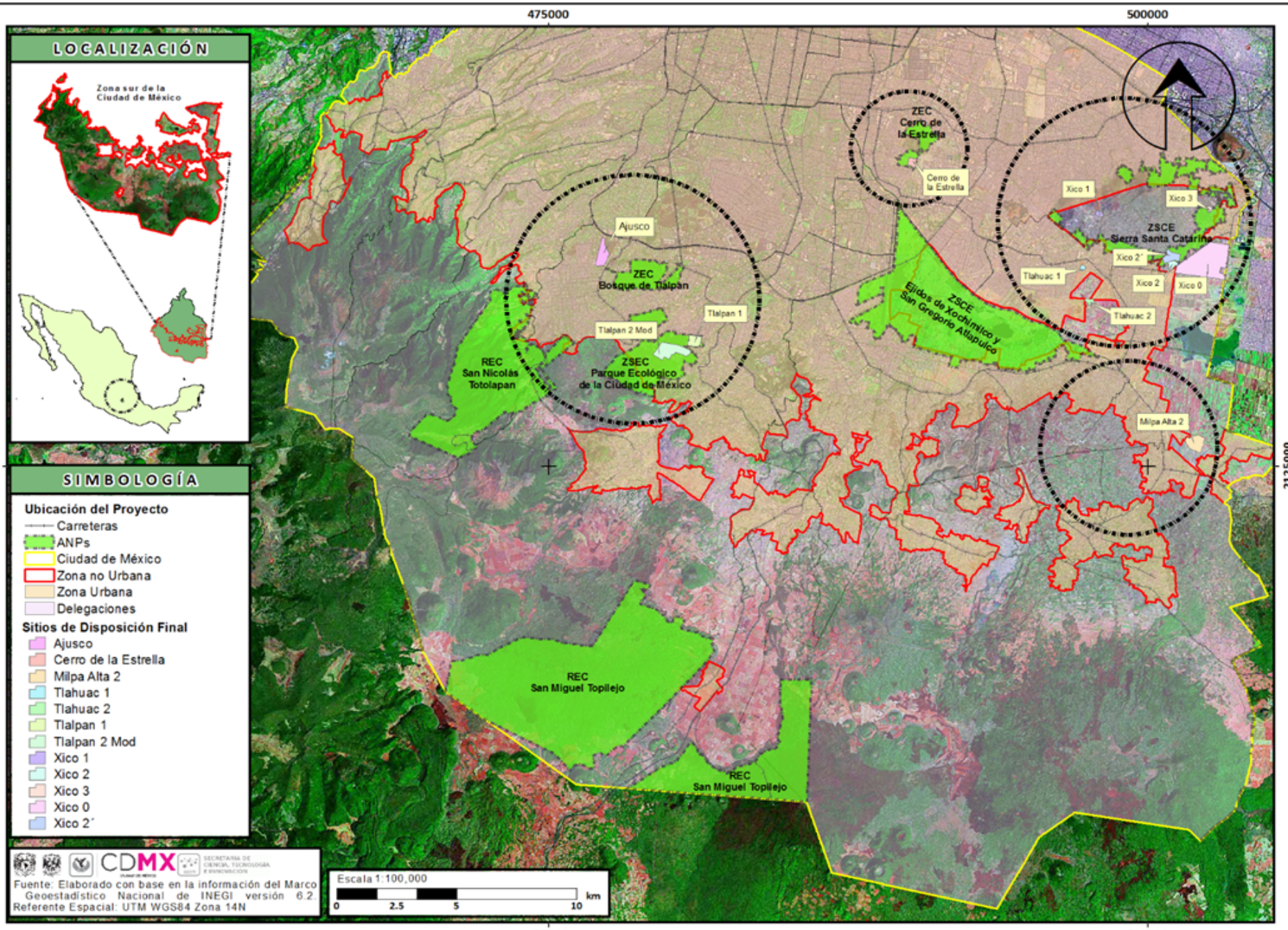


Materials and methods

- The hierarchical scheme of the used technique (EMC), has three basic levels: **final goal, decision criteria (usually accompanied by sub-criteria), and solution alternatives** [Malczewski and Rinner, 2015].

  The general function is represented in Equation 1.

$$V(A_i) = \sum_{k=1}^{n} w_l w_{k(l)} v(a_{ik})$$

- Where $v(a_{ik})$ is the value function, w_l is the weight associated with the l_{th} objective ($l = 1, 2 ..., p$), and $w_{k\,(l)}$ is the weight assigned to the k_{th} attribute associated with the l_{th} objective.

Materials and methods

- In order to use the MCE technique, there were use all variables and criteria which have an important impact on the host or reception capacity of the territory.

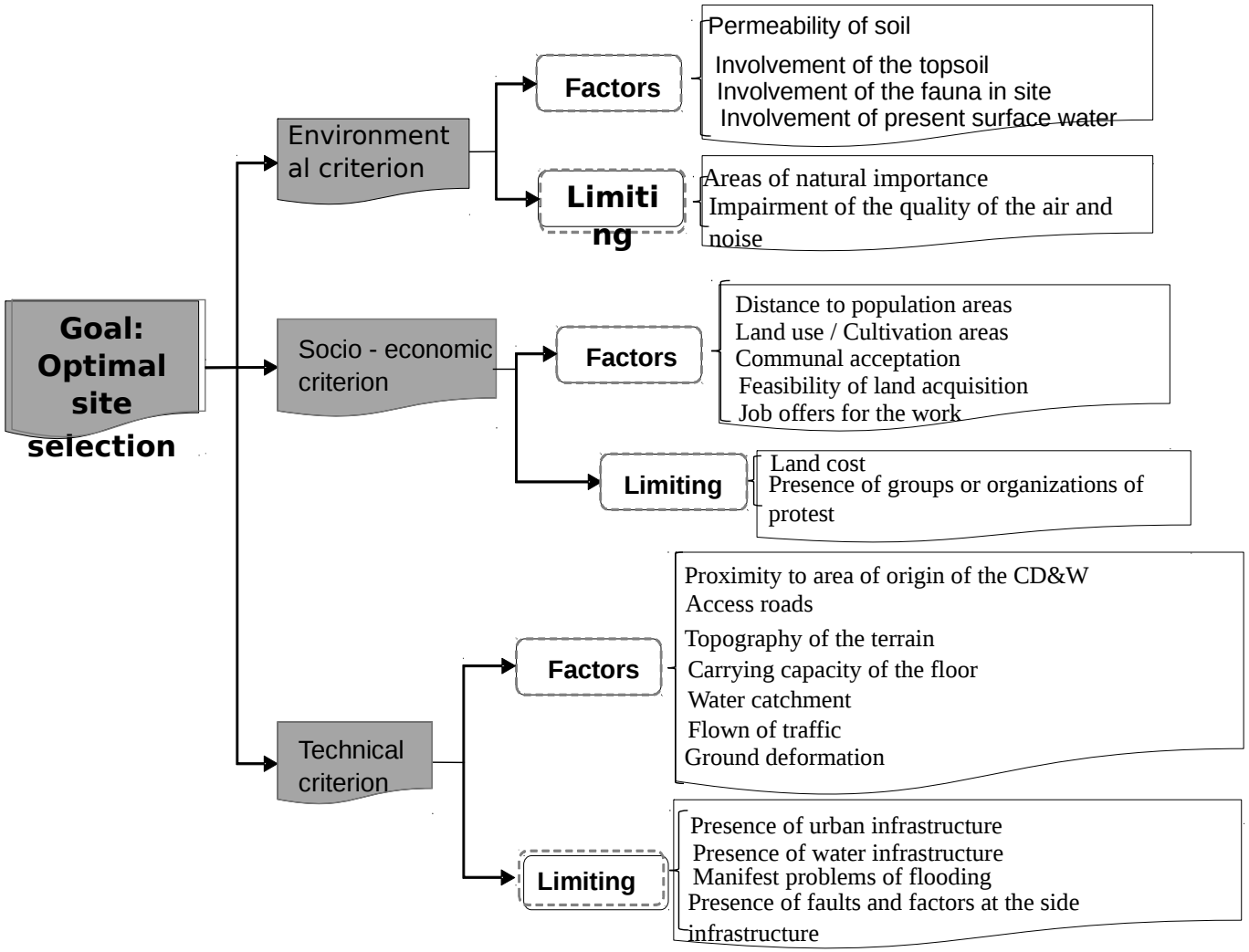
The steps involved in the evaluation using the EMC-AHP technique are:

1. Identification of relevant criteria and / or sub-criteria.
2. Construction of a model of the hierarchical analytical process.
3. Performing pairwise comparisons of the elements on the same level with respect to the elements.
4. Calculation of the weights derived from the paired comparisons, generating the corresponding matrices.
5. Test of the consistency of the generated matrices, by calculating the consistency ratio.
6. Repeat steps 3, 4 and 5 for all elements at all hierarchical levels.
7. Synthesis of all weights for the elements in each level.
8. Evaluation of total consistency.

Hierarchical scheme

- The first level in the hierarchical scheme, is the goal that is intended to reach.
- The second level was called general criteria (GC), and it was divided into 3 areas: "**environmental, socio-economic and technica**l".
- The third level corresponds to the variables employed; this level was called specific criteria (SC), divided in two aspects: "factors and limitations"

Hierarchical scheme used in the EMC



Materials and methods

Methods:

- Localization criteria: factors and limitations.
- Weighting of criteria and sub-criteria: Using comparison that is based on a system of qualification by importance.
- Standardization of criteria: To normalize levels or categories of each variable or SC, applied a simple appraisal of values ranging from 1 to 3 for the factors, and 0 or 3 to the constraints; in this assessment, the smaller values correspond to the most unfavorable or restrictive condition, while the highest values are equivalent to the favorable condition.

Results and discussion

- Final quilificación => 1,9 Viable site.
- 1,8 =< Final quilificación < 1,9 Medium-Viability site
- Final quilificación < 1,8 Non-viable site.

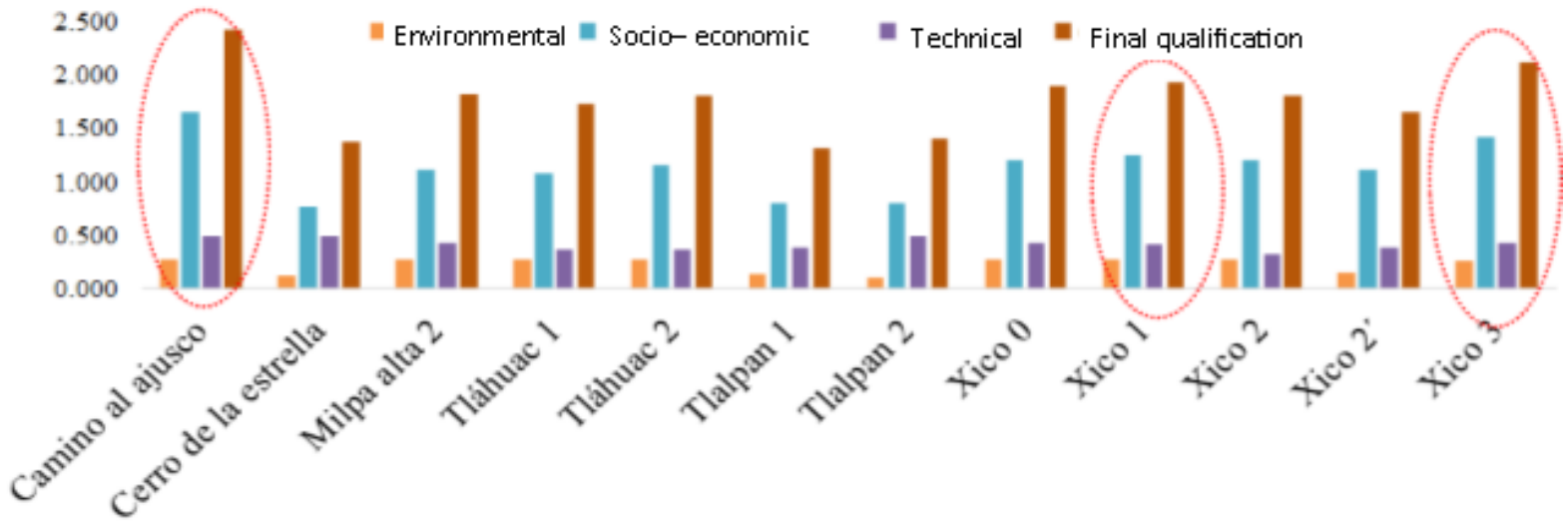


Figure 6. Results of evaluated sites with the three considered criteria

Sites with higher scores

Figure 4.Camino al Ajusco

Figure 5. Xico 3

Figure 6. Xico 1

- Camino al Ajusco”, “ Xico 3” and “Xico 1”, obtained the highest scores, since they complied with the variables of the environmental, technical and socio-economic criteria; being the last one the most important.

Conclusion

- The methodology presented, evaluated and determined the most viable sites regarding environmental, socio-economic and technical variables. The sites that obtained the highest scores were: Camino al Ajusco, Xico 1 and Xico 3. Finally, it is important to mention that, Multi-Criteria Evaluation methodology could be applied to similar studies in different regions of Mexico.

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