

## Optimal location of a biomass power plant in the province of Granada analyzed by multi-criteria evaluation using appropriate Geographic Information System according to the Analytic Hierarchy Process

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### Abstract.

Nowadays renewable energies are in a period of growth especially because of the last changes in the European and national rules. For example, in Spain, the Junta de Andalucía in its Andalusian Plan for the Energetic Sustainability 2007-2013 suggests only the use of energies of renewable origin to achieve its aims about energetic matters.

In this context, we have developed this study to find the location with the best reception capacity to implant a biomass plant in an area. The method used is based in a multi-criteria evaluation (EMC) using appropriate geographic information system (GIS) according to the analytic hierarchy process (AHP). The steps of our method are now explained:

1. **Identify factors:** Factors involved in the process are established, distinguishing between analysis criteria (*energy potential, availability of biomass, highway knots accessibility, protected natural areas*) and exclusion criteria (*existence of other biomass plant, grid distance, availability of water, influence area of the plant*).
2. **Mapping generation:** Consists in obtaining a cartographic map for each of the analysis criteria that have been defined previously, from the existing public mapping.
3. **Multi-criteria evaluation:** MCE is performed using the analytical hierarchy process through the ArcGis extension called "AHP". The *map of territory's reception capacity*, that show the aptitude and capacity of reception of the territory to host a biomass plant, will be generated as result of this process.
4. **Application of the exclusion criteria:** Consists in applying on the *map of territory's reception capacity* each of the exclusion criteria to determine, among all these locations, the one that most interests us.

5. **Solution and report generation:** The final report should contain all the information about the study.

Once the guidelines to follow are defined and the whole process of analysis described, it was considered desirable to apply it in a real area to check its validity. Taking into account the big potential of biomass in Granada in Southern Spain due to the existence of a large natural park, we choose that province.

In this manner, the results obtained have been very positive and give an idea of the effectiveness of this method since each of the alternative locations found during the study are equivalent to a real biomass plant proposal: two of our alternative locations correspond to an actual proposed installation of a biomass plant in the municipalities of Caniles and Salar, respectively and the solution (the biomass plant in Deifontes) is very close to the existing biomass plant in Moclín.

On the other hand, through this study we have demonstrated the ease with which you can use a GIS software and the many possibilities allowed thanks to its numerous tools and extensions. Thus, just as our system determines the optimal biomass plant location by means of a multi-criteria evaluation according to the analytic hierarchy process, other methods could be developed too.

Finally, just mention that this work leaves open an important research field in the topic of application of GIS to solving problems related to renewable energy and, in particular, in the subject of biomass.

### References

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