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A review on the Spanish Method of visual impact assessment of wind farms: SPM2

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ABSTRACT

This work offers a review of the so-called Spanish Method for the visual impact assessment of wind farms. The five coefficients originally proposed in the method have been analysed and discussed from several approaches: validity, efficiency, limitations and need of actualisation, among others. As a result, we establish a set of new proposals that update or modify the definition or calculation of these coefficients, but always trying to retain their original meaning. The work is complemented by a short case study in which we compare the values of the coefficients of the original Spanish Method with those arisen from our new proposal. The difference is often relevant, both in the numerical value of the coefficients and in the improvement of their ability to describe the visual effect. Finally, the new formulation of the Spanish Method opens a possibility for the public participation in several moments of the process.

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1. Introduction

In 2004 the journal Renewable and Sustainable Energy Reviews published an article explaining "a methodology to predict, before its construction, the visual impact that a wind farm can have" [1]. The paper was groundbreaking and somehow surprising: having elapsed only 18 days between its reception and its approval, having cited just seven references (all of them national regulations related to the general problem of the deployment of wind farms in Spain), the method did not offer a case study, nor a method for its validation. In spite of this, it established a very right framework to assess several visual and perceptual aspects that were then a subject of analysis for the scientific community, the stakeholders and some other groups involved in the planning, development and use of wind farms.

Moreover, the work was greatly concise, original, intuitive and logical. It proposed a rather easily replicable methodology, as well as a way to quantify some aspects considered critical in the process of visual impact assessment of wind farms.

Since then, the Spanish Method has become a reference very often cited in the reviews of the contributions studying the visual impact caused by wind farms. More precisely, several works report to have made use of this method to assess impacts: (i) by contrasting their results with other ones obtained by means of public acceptance's methodologies [2,3], (ii) by comparing the visual effect of several wind farms, and the variation of their Spanish Method coefficients under a particular mitigation hypothesis [4] and (iii) by studying the time of visual exposure of a wind farm by the observers travelling along a particular motorway [5].

The Spanish Method can be integrally programmed [4]. That makes it possible to characterise the effect of one – or several – wind farms over the whole visual inventory, either to a local, regional or trans-regional level. In general, the computation time of this task is high but acceptable. The Spanish Method results more reliable to compare different scenarios than to obtain an absolute visual assessment, but that happens with most of the methods based on visual indicators [6–9].

As a scientific work, the Spanish Method needs corrections and updates. In this article we show how, once deeply reviewed, it helps to get a full meaning of the numerical characterisation of the visual effect caused by a wind farm. It is also possible to compare different mitigation proposals and gives a way to address a participatory process, what always helps to give transparency to the whole project.

The work is arranged as follows: the Spanish Method is reviewed in Section 2. In Section 3, several improvements to the method are discussed. Section 4 shows a brief case study, useful to compare the values of the coefficients before and after the proposal of improvement carried out in Section 3. Section 5 describes how and where this improvement of the Spanish Method can be used currently, into a computational free use environment. Finally, in Section 6, the paper offers some conclusions as well as some reflections about the limitations of the present work, the strategy of improvement and about the research itself.

2. A review of the Spanish Method

The Spanish Method was established on the basis of five coefficients, which are later integrated into a single value. It enables access to a table that gives back the definitive impact assessment, expressed as a number into the interval [0–1], whose extreme values represent respectively a null visual impact or an unacceptable visual impact. Next, the aforementioned five coefficients are presented.

2.1. Visibility coefficient of the wind farm from village (a)

The method establishes a first coefficient for each one of the villages to be analysed. If the visual impact is presumed to vary along a village, this one is divided into homogeneous subareas. Each subarea must have a uniform sight of the wind farm (this is, it must see the same number of turbines).

The number of turbines seen from each area is expressed as a much per one of the total of turbines of the park. Therefore, if the coefficient a has, for example, a value of 0.6, it means that a 60% of the turbines of the park are seen from the village. Thus, such a value of 0.6 can be understood as an average value or as a probability. As usual, it is accepted that a partially seen tower is computed as a visible one. However, the next considerations cannot remain unnoticed:

- No procedure is reported to obtain a subdivision of the village in homogeneous areas. So, this aspect of the method is really asystematic.
- The areas having whole visibility or null visibility over the wind farm are not studied at all. However, these extreme values should be always reported in some manner. Not doing it could be misunderstood as a way to deliberately bias or hide the impact in these significant parts of the village.

These issues are analysed in Sections 3.1 and 3.2.

2.2. Visibility coefficient of village from wind farm (b)

The method establishes a coefficient b defined as the ratio between the number of buildings that are visible from the park and the total number of buildings in the village. This definition is particularly imprecise with respect to:

– The meaning of the property "buildings seen from the park" provided that the turbines can see very different sets of buildings of a village.
– The meaning of "visibility" provided that the upper floors of a building can be seen at the same time than its lower ones remain hidden by other buildings placed forward.
– The way to capture the geometry of buildings and to assign them the attribute of a certain height.

We will deal with this matter in Section 3.3.

2.3. Visibility coefficient of the wind farm taken as a cuboid (c)

The method sets up a coefficient c that assesses the combined effect of the observer's position with respect to the park (coefficient ν) and the number of turbines it has (coefficient n). Coefficient ν forces to divide the surrounding area of the wind