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Article

Territorial competitiveness revisited from the resource-based view: A comparative study in the wind energy sector on islands

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Abstract: This paper aims to propose a new approach of territorial competitiveness assessment revisited from the resource-based view, as the combination of location-specific resources and capabilities can improve the territorial socio-economic development. A territorial competitiveness index is calculated in order to assess the potential of renewable energy sources to improve the sustainable development in islands. Different sources of information and methodologies have been employed to measure the variables included in the model, thus ensuring a rigorous process in the index calculation. In order to quantify the basic resources, for example, a methodology based on a multicriteria analysis (MCA) with geographic information system (GIS) is suggested, with the objective of obtaining an indicator called index of available territorial resources. This index synthesizes the map information through a numerical value that allows integrating the territorial resource with other indicators of the model. The results of the study show that capability development is a key factor to better exploit the territorial resource endowment in order to achieve a competitive advantage.

Keywords: Resource-based view, regional competitiveness, renewable energy, wind power, island.

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1. Introduction

The study of islands, called nissology [1], is gaining research relevance specifically when islands are located in outermost regions due to the specific socio-economic aspects of these territories, but also because they are smaller, are far from mainland, form part of a wider fragmented region and have land and climate constraints. These features make outermost territories economically dependent on imports of basic products and services. Baldacchino [2] highlights the emerging academic field of island studies in his research work, and theorises islandness or insularity, a more common term. At the EU level, regions with specific geographical characteristics, including islands, have received much "[…] regional policy attention and their economic development is considered important in helping the EU to attain its important 'territorial cohesion' objective" [3].

However, although islands can be a specific research goal, "[…] their analytical relevance in social science does not imply that we need new and different theories and instruments to understand social realities in islands" [4].

Renewable energy sources (RES) are considered a key factor in the sustainable development of islands in such an extent that the future of the land largely depends on how RES are obtained and used [5-8]. The increasing demand of energy, the environmental issues related with fossil fuel energy, and the social concern for the sustainability bring about the necessity to study alternative energy sources. The current energy model is under question, especially when renewable energy is being

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favoured for its unlimited feature as well as its more homogenous territorial distribution, and it does not generate dangerous waste. In this regard, the Directive 2009/28/EC of the European Parliament and of the Council confirmed the previously established goal that renewable energy reach 20% of energy consumption of the EU in 2020, aimed at creating a model of sustainable economic development that favours the safety of the energy supply, competitiveness, and environmental sustainability.

It is necessary to emphasize that the binomial insular territories plus renewable energy industry is an interesting research context. As Chua et al. [9] points out, "Despite extensive research works being done on renewable energies, the needs to provide islands with energy alternatives for future development are only modestly discussed in various literatures". Islands that depend upon oil sources to generate electricity are usually non-efficient systems, but they can put into value the territorial natural resources -such as wind, sun, or sea- in an attempt of self-generating the power demanded by firms and citizens. The Canary Islands -the only Spanish Outermost European Region- cope with the mentioned problems of insularity, but the good orographic, geographical and weather conditions allow them to turn those handicaps into sustainable competitiveness.

The sustainable development of a territory is closely related to the efficient management of its resources. As Munda and Saisana [10] point out "[…] the concept of sustainable development […] defends the idea of harmonization between or simultaneous realization of economic growth and environmental concerns". In this line, Rutkauskas [11] indicates that the competitiveness of a territory depends on its capacity to efficiently use the available resources, as well as its ability to introduce innovation and positive changes in an environment that can assure sustainability. As Gallardo et al. [12] state, the territory is, in itself, a key strategic asset to achieve competitiveness, being necessary to create capacities to put it into value. In addition, Colletis-Wahl and Pecqueur [13] consider that it is important to take into account not only active but also latent resources as the latter could reveal new niches of endogenous productive activity in the territory that strengthens its innovation process. To that end an estimate of the available resources in the territory is needed, thus enabling a strategic management that guarantees sustainability. However, the geographic distribution of the territory's physical resources is not considered in most territorial competitiveness research [14-18].

Taking the above considerations into account, this research work aims to propose a new approach of territorial competitiveness assessment revisited from the resource-based view -as the combination of location-specific resources and capabilities can improve the territorial socio-economic development-, and to apply it in the comparison of two islands. In general, the proposed model makes it possible to carry out a comparative analysis of the territorial competitiveness of two or more territories for a specific industry based on the local resources and capabilities (i.e., a model useful for resource-based and capability-driven industries). But it also evaluates the ability of the key players to deploy the resources and capabilities towards the socio-economic development in order to maintain or increase the quality of life of its inhabitants in terms of sustainability concerns. From an economic perspective, large electricity systems are not efficient in islands, because economies of scale are not feasible; therefore, an alternative energy model -different from those used in continental regions- is necessary [19]. In this line, Del Río and Burguillo [20] state that "[…] renewable energy sources (RES) have a large potential to contribute to the sustainable development of specific territories by providing them with a wide variety of socioeconomic benefits, including diversification of energy supply, enhanced regional and rural development opportunities, creation of a domestic industry and employment opportunities".

In furtherance to the introduction, this paper has been structured into four sections. In the second one, methodological aspects of the empirical work in the renewable energy sector are considered, with a detailed explanation of the territorial competitiveness index calculation for the wind power subsector. Third, empirical results are presented. And finally, a discussion is given and the main conclusions of this research are stated.

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In the last two decades an interesting academic debate has emerged in relation to the way in which territorial competitiveness can be conceptualised and measured. The concept of territorial competitiveness has received much attention since Porter [21] published The competitive advantage of nations with the objective to explain the international success of individual industries in individual countries. However, the debate on the concept of territorial competitiveness and the variables for its measurement remains open, posing an interesting subject of study both from a theoretical and an empirical perspective [22-24]. Parallel to this debate, territorial competitiveness has gained importance in government circles. With the purpose of developing policies which promote and encourage the sources that impulse socio-economic development of territories, increasing interest in the identification of the main determining factors has arisen. As a result, a number of models that measure competitiveness at national, [25,26] regional [17] and local levels [14] have been proposed.

The strategies of a territory can be formulated on the basis of its own resources and capabilities, giving rise to a better performance and sustainability in the economic activity [27, 14,28,29]. This circumstance suggests that the resource-based view (RBV) can be a suitable theoretical framework to support the proposal of a territorial competitiveness model [30,31]. In fact, territories develop themselves from unique contexts defined by industrial, historical and local settings, as well as by the pattern of long-term investment in resources [32]. In this line, West III and Bamford [31] point out that certain aspects of the RBV are appropriate to apply to a territorial context, because each territory has its own bundle of resources that can change overtime, giving rise to better performance and higher levels of self-sustainable activity. Specifically, three reasons are given by the authors: (a) RBV is focused on the competitive advantage generation based upon the creation of heterogeneous resources, in combination with the imperfect mobility, imitability, and substitutability of its resource positions; (b) an adequate combination of resources leads to the creation of a territorial capability; and (c) the dynamic capability concept, that suggests that resources and capabilities evolve overtime. In this vein, Harmaakorpi [33] affirms that "Regional development strategies should be based on the sound assessment of regional resources, as well as on forming dynamic capabilities aiming to develop the resource configurations in order to form regional competitive advantage".

All the above considerations have been integrated into a holistic strategic model for the assessment of territorial competitiveness (see Fig. 1).

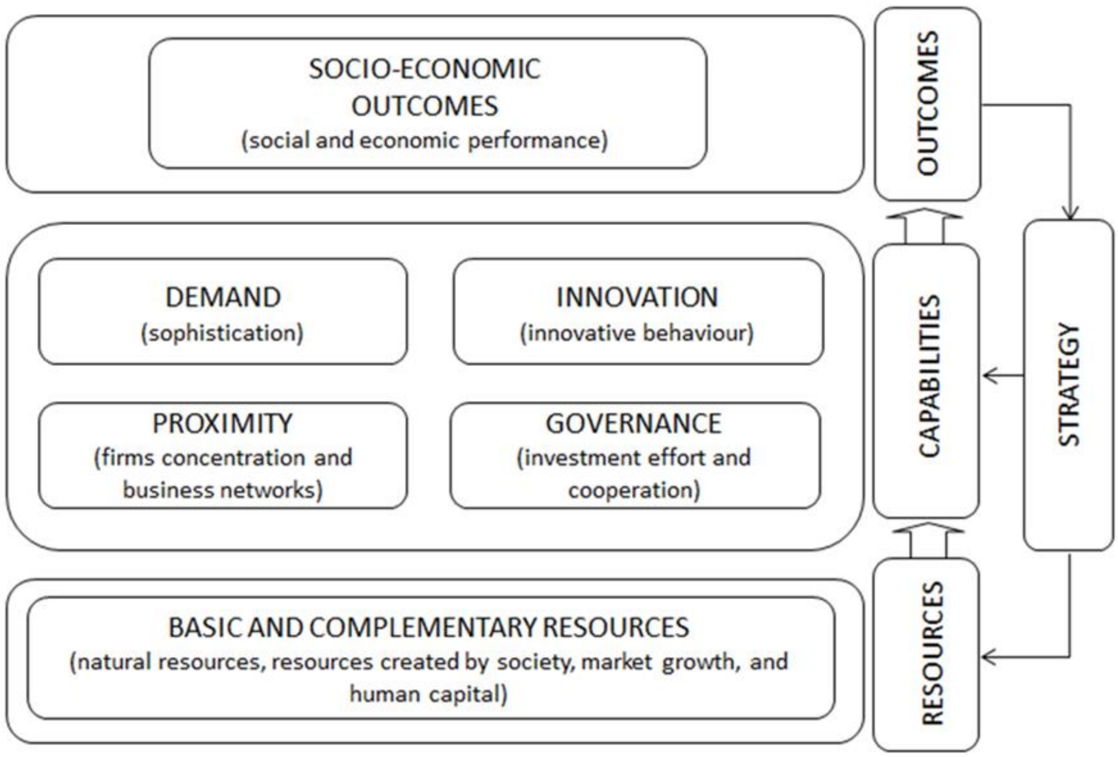

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Figure 1. Model of territorial competitiveness from the resource-based view.

This model is based on the concept of territorial competitiveness conceived as the appropriate combination of territory-specific resources and capabilities, in order to improve socio-economic development and increase the quality of life of its inhabitants. This definition supports Silva's [34] and Azena's [35] proposals that territorial development should be grounded on a process that takes advantage of its own natural, human, institutional and organisational sources, in order to transform local productive systems and to improve the life quality of citizens.

In this research, basic and complementary resources are distinguished. Kitson et al. [36] point out that territorial differentiation is due to the external assets that are directly or indirectly exploited by the local firms, thus improving their effectiveness, innovation, flexibility, and dynamism, and therefore the territorial productivity and competitive advantage. But existing resources are not enough to ensure territorial development; additionally, territorial capabilities are needed in order to exploit opportunities and to support the creation of competitive advantage, throughout knowledge, learning, and local creativity [37,38,29]. With the aim to determine the capabilities in a territory, the national diamond by Porter [21] has served as a starting point. In this case, three of its angles -demand conditions; firm strategy, structure and rivalry; and related and supporting industries- have been adapted to the proposed model through three elements: demand, innovation, and proximity. Furthermore, government -under the term "governance"- has also been considered because it influences the effectiveness with which resources become outcomes and vice versa [14].

Finally, the proposed model supports the idea that a high productivity value might not be associated to a strong territorial competitive advantage; instead, this competitive advantage should materialise through both social and economic territorial performances. Therefore, although the best outcome indicator for territorial competitive advantage is productivity in terms of GNP per capita - under the premise that the standard of living of a nation is determined by its economic productivity [14,39,17,18,40,25,41,26], it is also necessary to include a social perspective, because the life quality of citizens and social welfare goes beyond the image of relative opulence reflected in the GNP [35,42-45].

Based on this model of territorial competitiveness, an assessment of the bundle of territorial basic and complementary resources, as well as capabilities, is required to determine a value that represents the territorial competitiveness. Moreover, an evaluation of the socio-economic outcomes has to be carried out for a better understanding of territorial competitiveness linked to those resources and capabilities. In this respect, the outcomes provide information about how efficiently the resources and capabilities are used (those territories that use fewer resources to obtain better performance), as well as how effectively they have been deployed (the goals are achieved). This analysis of the available resources and capabilities, as well as the outcomes achieved, should be used to establish different strategies that enable a sustainable improvement of territorial competitiveness.

2. Materials and Methods

2.1. The research context

In this research, a comparison of the competitive advantage of two insular territories in the wind energy sector is carried out. The islands are Gran Canaria and Tenerife, in the Canary Islands, one outermost region of the European Union. Each island has its own autonomous insular government, a premise that has been assumed in the present paper to approach territorial competitiveness [46].

This work is focused on the analysis of the wind energy, due to the significant potential that this archipelago has to generate it [47,5]. As Lenzen [8] states, "Wind power is by far the most utilized renewable energy source on islands around the world". In the Canary Islands, only 11,8% of the installed electrical power comes from renewable sources. A 42.2% of that power comes from wind

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sources with approximately 52 wind farms (377 wind turbines). In this line, the use of autonomous energy sources is essential to achieve the most important energy objectives in the Canary Islands: the reduction of supply vulnerability, the decrease in external energy dependence, the lowest cost of energy, and the protection and preservation of the environment [5].

Nevertheless, if the wind power installed per number of inhabitants in the Canary Islands is compared to some countries in the European Union with the same or less wind resource, it is observed that the Canary Islands have a very low ratio of 72 W/inhabitant in 2015 [48], compared to a value higher than 490 W/inhabitant in Spain or 471 W/inhabitant in Portugal [49]. This data reveals the need for a more effective use of this kind of energy in the Canary Islands in order to adjust the available resources to the existing demand in a sustainable way.

2.2. Variables

2.2.1. Basic resources

Apart from wind speed, other factors may favor the development of wind energy in the territory. In order to quantify this variable, it is suggested a methodology based on a multi-criteria analysis (MCA) with geographic information system (GIS), aimed to obtain an indicator called available territorial resource index (see Fig. 2 and Fig. 3). The stages of the proposed methodological framework are explained in the following paragraphs.

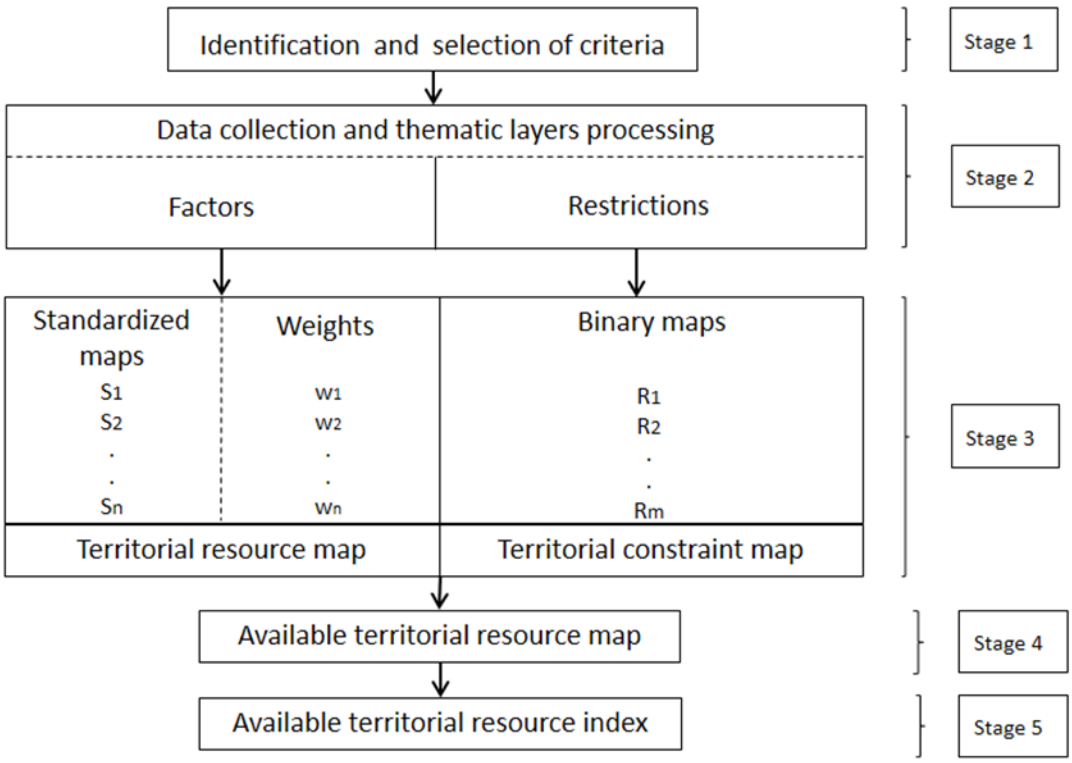

Figure 2. Methodology for available territorial resource map and index.

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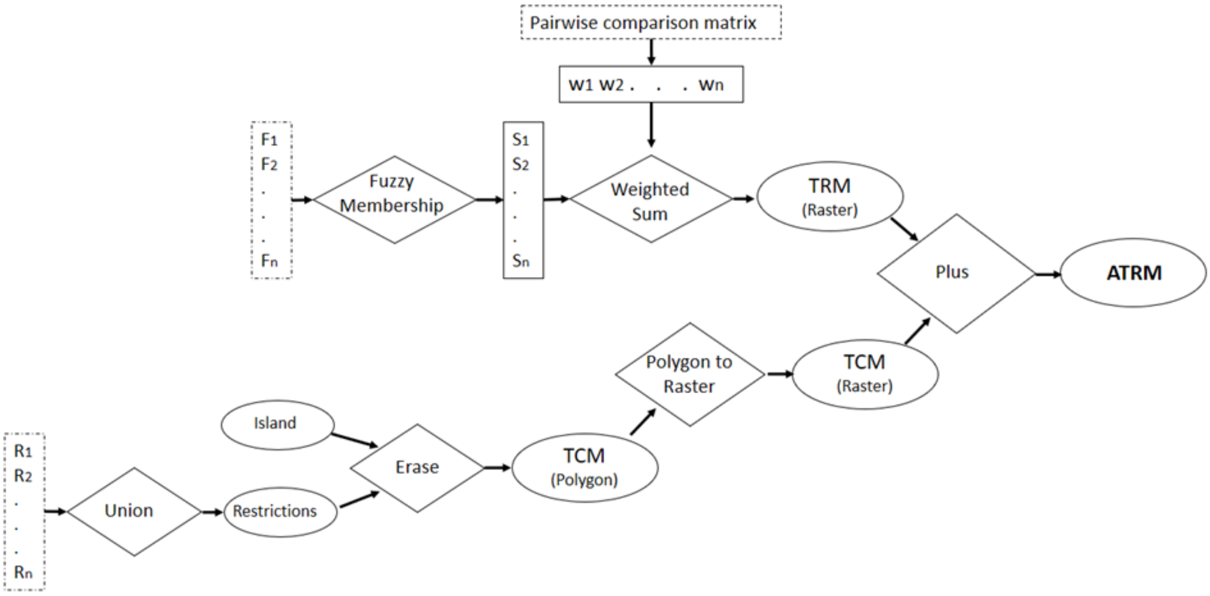

Figure 3. GIS model for stages 3 and 4.

Stage 1: Identification and selection of criteria. The process starts with the identification and selection of the key criteria for the evaluation of the territorial resources involved in the development of the wind energy. In this study, the data were obtained from GRAFCAN, the official supplier of geographical information in the Canaries. Literature suggests that these criteria should be classified into factors or criteria that favour the wind energy, and constraints or restricted areas (Table 1).

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Table 1. Classification of factors and constraints.

Factors		Authors
Wind speed	Less than 4 m/s = 0 More than 10 m/s = 1	[50-59]
Slopes	More than 60% = 0 Less than 10% = 1	
Visual impact	Visible from more than 4 villages = 0 Visible from 0 villages = 1	
Proximity to electricity lines	More than 2,000 m = 0 Less than 300 m = 1	
Land use	Incompatible area = 0 Compatible area = 1	
Proximity to urban areas	More than 5,000 m = 0 Less than 1,000 = 1	
Proximity to road access	More than 2,000 m = 0 Less than 300 m = 1	
Constraints		**Authors**
Protected areas	Perimeter	[50,51,60,54,61,62,55,63,57]
Water reservoirs	Perimeter	
Airports	Perimeter	
Roads	Width	
Ravines	5 m from public water domain	
Remote housing	Perimeter of the built up areas	
Population area	Perimeter	
Main roads	20 m from the centre axis	
Sea-land limits	100 m inland from the shore	
Military areas	Perimeter	

Stage 2: Data collection and thematic layers processing. In the second stage, the criteria are added to the GIS via different thematic layers from the geo-information available in the Spatial Data Infrastructure (IDECanarias).

Stage 3: Territorial resource map and territorial constraint map. In order to create the territorial resource map (TRM), the thematic layers are made in raster format. As these layers have different measurement units, it is necessary to standardize them in order to carry out a joint analysis. In this case a fuzzy standardization is used (between the values 0 and 1). To this end, it is necessary to identify the critical point of transition between 0 and 1 in each factor (Table 1). Furthermore, not all factors influence with equal weight. In order to assign this weight a square matrix is created where the pairwise comparison of its factors can be carried out [64]. A value is assigned to each element of the matrix which represents the relative importance of the factor in the row and column in relation to a scale from 9 (most importance) to 1/9 (least importance). A consistency ratio of 0,08 was obtained; below 0,1 is suitable [65]. Once the definite weights are calculated each pixel takes on a suitable value through the linear weighted summation [66] of the thematic layers that represent the different factors. In the territorial resource map (see Fig. 4), the most suitable areas will take on a value closer to 1 and the least suitable areas will take on values closer to 0.

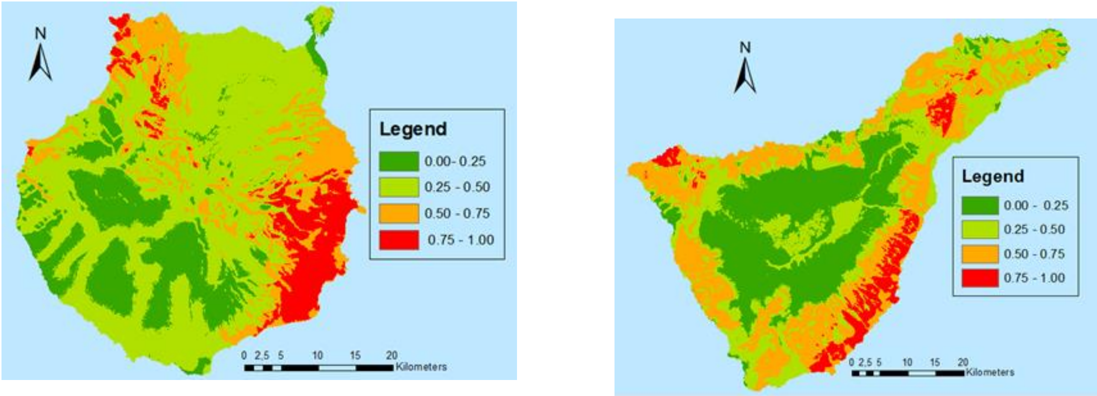

Figure 4. Territorial resource map for wind energy sector of Gran Canaria and Tenerife.

The next step in the process is the elaboration of the territorial constraint map (TCM). The thematic layers that make up this map are done in vector format. This format defines and measures accurately the surface of the areas which are suitable for the activity researched. Due to its dichotomous nature, its standardization is carried out through a Boolean method. The territorial constraint map identifies the area of the territory that can really be used for the development of wind energy considering the constraints established (see Table 1).

Stage 4: Available territorial resource map. The objective of the fourth stage is to obtain the available territorial resource map (ATRM) (see Fig. 5). In this document, the influence of all the factors with respect to their assigned relative weight is synthesized. The application of constraints accurately delimits the territorial area susceptible to use. To facilitate visualization, it was classified in terms of four suitability levels (see Table 2): poor (0.00-0.25), moderate (0.25-0.50), suitable (0.50-0.75) and highly suitable (0.75-1).

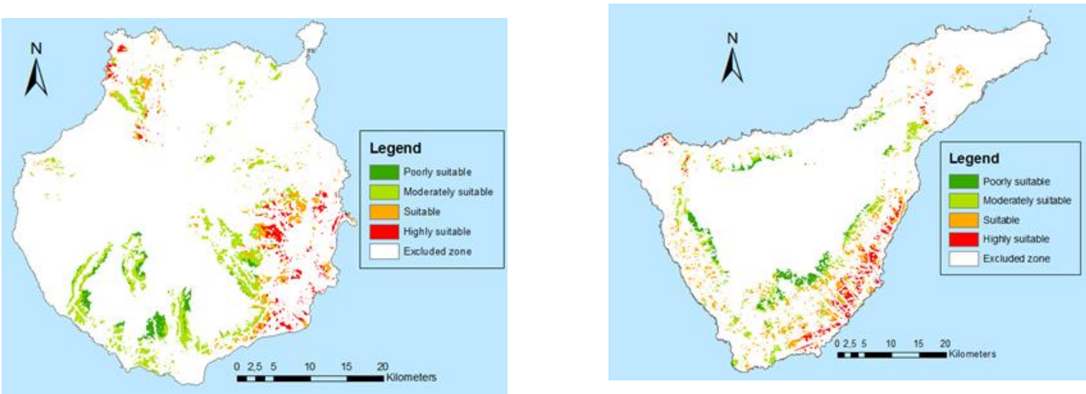

Figure 5. Available territorial resource map for wind energy sector of Gran Canaria and Tenerife.

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Table 2. Suitability levels of land for wind farm siting.

		GC		TF	
Suitability	**Pixel value**	**Area (ha)**	**(%)**	**Area (ha)**	**(%)**
Poorly suitable	0.00-0.25	1,751.13	11.80	3,365.23	22.68
Moderately suitable	0.25-0.50	8,320.31	56.08	5,912.66	32.12
Suitable	0.50-0.75	2,851.07	19.22	6,421.49	34.88
Highly suitable	0.75-1.00	1,914.55	12.90	2,710.34	14.72
Total		14,837.06	100.00	18,409.72	100.00

Stage 5: Available territorial resource index. The process culminates with the calculation of a numerical value: the available territorial resource index (ATRI). This index enables to carry out a comparative evaluation among territories. This index was obtained as a result of multiplying the arithmetic mean of the value that the ATRM pixels take on by the available areas obtained from the TCM, according to (1).

$$\text{ATRI} = \frac{\sum_{i=1}^{n} CRT_i}{n} * \text{S} = \text{CRT} * \text{S} \quad (1)$$

where CRTi is the value that represents the quality of the territorial resource of each pixel that the GIS calculates for each island, n is the number of pixels of the available area, and S is the available surface area.

2.2.2. Complementary resources

First, the average annual growth of electrical energy network production is used to determine the market growth [15,16]. Second, the human capital variable was measured by the number of workers in wind energy companies, and by the percentage of university students who study engineering degrees associated with wind energy [67,68].

2.2.3. Capabilites

Demand.

Three indicators measure sophisticated demand. First, the ratio between the amount of electrical energy produced by wind power and the total amount of electrical energy in the network consumed in each island. Second, the percentage of high school and university graduates over total population, as Moon et al. [18] and Sledge [69] state that the sophistication of demand is positively associated to the educational level. Third, the percentage of homes that separate rubbish, as the degree of people's commitment with the environment may involve a favourable attitude toward the renewable energies [30].

Innovation.

Santos [70] indicates that the regional innovation systems have an important role to play and offer possibilities of producing regional competitive advantage. The indicators that could provide a good measurement of innovation behaviour are the following: the number of patents for the sector [71], the number of final degree works associated with wind energy, and the number of publications in scientific journals associated with wind energy at the University of Las Palmas de Gran Canaria and the University of La Laguna [72-74].

Proximity.

There is a wide consensus that firms are more competitive when they are agglomerated [75]. This is so because they exploit certain advantages associated with relations to other companies and agents directly or indirectly involved in such an activity [21,76]. However, firm's concentration is not enough to improve territorial capability, as the creation of business networks is also necessary to increase added value and create synergy [77-80]. In this study, this territorial capability is measured by two variables: firms' concentration and business networks. The firms' concentration was measured by the location index, calculated through the method of the nearest neighbour using GIS [81]. And the business networks were measured through the network effect as a combination of network strength and openness [78]. This information was obtained through a survey. The answer rate was 57%, with an error of 8.7%.

Governance.

Government is a decisive factor for the renewable energy sector, because without governmental support its development would be slower [82,83]. In this study, governance is measured by two variables: investment effort and cooperation. The first one is evaluated by the percentage of public investment planned in each island in comparison with the whole for the Canary Islands [84]. And cooperation is assessed by three indicators: (a) coordination between public institutions and wind energy sector firms, (b) effectiveness of public institutions in the management of the wind energy sector, and (c) promotion of the sector by public institutions. These indicators were also obtained through the questionnaire sent to the firms in the sector.

2.2.4. Socio-economic outcomes

This variable is measured by means of three indicators: productivity, market share and social outcomes. First, based on the research by Gardiner et al. [39], the outputs of territorial competitiveness should be measured through productivity. In this industry, the equivalent hours - that evaluate the energy produced in the wind farms per installed unit of power (kWh/kW)- turn out to be an optimum indicator for productivity. Moreover, two other productivity indicators were considered: (a) reduction of energy dependence on oil products, measured by the amount of tonnes of oil equivalent (toe) that the territory saves as a consequence of using wind energy; and (b) saving in energy costs, measured by the proportion of wind energy produced in relation to the total energy -assuming a lower cost of wind energy. Second, industrial penetration of wind power is measured by means of: (a) the wind power installed per number of inhabitants (W/inhabitant), which represents the importance of the sector; and (b) the percentage of wind energy firms, that shows the specific importance of the sector in the economy of the territory. And finally, in this research social outcomes are measured through: (c) the reduction of CO_2 emissions to the atmosphere because of wind energy use; and (d) the company survival rate of the sector as a measure of its potential for sustainable economic growth.

In Table 3 there is a summary of the indicators used to measure the different variables, as well as the sources of information for each indicator.

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Table 3. Sources of information and raw values.

	Elements	Variables	Indicators	Sources
Resources	Basic resources	Available territorial resource	The available territorial resource index	State regional laws plans Academic literature on the setting up of wind facilities Wind resource of the Canary Islands (Canary Technological Institute) Mapping (GRAFCAN) Infrastructure of Spatial Data of the Canary Islands (GRAFCAN) Recommendations by the International Civil Aviation Google Earth Online information of the associations of wind firms
	Complementary resources	Market growth	Annual growth of electrical energy production (%) from 2000 to 2011	Energy data (Government of the Canary Islands)
		Human capital	University students of engineering degrees associated with wind energy (%) from 2005 to 2009	Annual reports of the universities (ULL and ULPGC)
			Workers in wind energy companies in 2011	Questionnaire SABI (database)

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				Cluster RICAM Online information of the companies
Capabilities	Demand	Sophisticated demand	Ratio between the amount of electrical energy produced by renewables sources and the total amount of electrical energy from 2000 to 2011	Energy data (Government of the Canary Islands)
			High school university graduates (%) from 2001 to 2007	Canary Statistics Institute Annual reports of the universities (ULL and ULPGC)
			Homes that separate their rubbish (%) from 2001 to 2007	Canary Statistics Institute
	Innovation	Innovative behaviour	Patents for the sector from 2001 to 2009	Spanish Agency of Patents Trademarks
			Final degree works associated with wind energy from 2003 to 2010	Annual reports of the universities (ULL and ULPGC)
			Publications in scientific journals associated with wind energy from 2003 to 2009	Annual reports of the universities (ULL and ULPGC) Annual research reports of the universities (ULL and ULPGC)
	Proximity	Firms' concentration	Location index	Cluster RICAM Online information of the companies Google Earth

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			Administrative Record of electricity facilities (Ministry of Industry, Tourism Commerce) *Mapa* software (GRAFCAN) Official Bulletin of the Canary Islands General Direction of the Land Mapping (GRAFCAN) Record of wind farms in process of authorization (Government of the Canary Islands)
	Business networks	Network effect	Questionnaire
Governance	Investment effort	Public investment planned in each island in comparison with the whole for the Canary Islands (%) from 2006 to 2015	*Energy Plan of the Canary Islands 2006-2015*
	Cooperation	Coordination between public institutions and wind energy sector firms (scale 1-5)	Questionnaire
		Effectiveness of public institutions in the management of the wind energy sector (scale 1-5)	Questionnaire
		Promotion of the sector by public institutions (scale 1-5)	Questionnaire

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Outcomes	Socio-economic outcomes	Productivity	Equivalent hours (kWh/kW) in 2008	Energy data (Government of the Canary Islands)
			Tonnes of oil equivalent (toe) saved in 2008	Energy data (Government of the Canary Islands)
			Wind energy produced in relation to total energy in 2008	Energy data (Government of the Canary Islands)
		Industrial penetration	Wind power installed per number of inhabitants (W/inhabitant) in 2014	SABI (database) Cluster RICAM Online information of the companies *Energy Plan of the Canary Islands 2006-2015*
		Social outcomes	Reduction of CO_2 emissions in 2008	Energy data (Government of the Canary Islands)
			Company survival rate	Questionnaire

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3. Results

Table 4 shows the values of the different resources and capabilities in Gran Canaria and Tenerife. As each indicator is expressed in a different unit, they should be unified on a 100-basis. For each individual indicator, the value 100 is assigned to the maximum ranked territory, while a proportional value is given to the remaining ones [18]. In the case where the variables are represented as a combination of indicators, a weight is assigned to each of them, taking into account the opinion of industry and academic experts.

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Table 4. Standardised values of resources capabilities in Gran Canaria and Tenerife.

	Elements	Variables	Indicators	GC	TF	GC	TF	Weights (%)	GC	TF
Resources	Basic resources	Available territorial resource	The available territorial resource index	6,473	8,853	73.11	100.00	100	73.11	100.00
	Complementary resources	Market growth	Annual growth of electrical energy production (%)	3.44	4.95	69.49	100.00	15	95.42	64.84
		Human capital	University students of engineering degrees associated with wind energy (%)	30.9	19.3	100.00	62.46	25		
			Workers in wind energy companies	312	178	100.00	57.05	60		
								POTENTIAL OF RESOURCES:	168.53	164.84
Capabilities	Demand	Sophisticated demand	Ratio between the amount of electrical energy produced by renewables sources and the total amount of electrical energy	6.64	3.86	100.00	58.13	60	100.00	72.84
			High school university graduates (%)	33.5	32.7	100.00	97.61	30		
			Homes that separate their rubbish (%)	61.12	53.06	100.00	86.81	10		
	Innovation	Innovative behaviour	Patents for the sector	8	1	100.00	12.50	55	100.00	20.62

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		Final degree works associated with wind energy	18	3	100.00	16.67	15		
		Publications in scientific journals associated with wind energy	16	6	100.00	37.50	30		
Proximity	Firms' concentration	Location index	1.86	1.33	100.00	71.29	30	100.00	82.74
	Business networks	Network effect	3.32	2.91	100.00	87.65	70		
Governance	Investment effort	Public investment planned in each island in comparison with the whole for the Canary Islands (%)	30.01	38.09	78.79	100.00	60	86.07	98.58
	Cooperation	Coordination between public institutions wind energy sector firms (scale 1-5)	1.82	2.00	91.00	100.00	40		
		Effectiveness of public institutions in the management of the wind energy sector (scale 1-5)	2.00	1.90	100.00	95.00			
		Promotion of the sector by public institutions (scale 1-5)	2.12	2.00	100.00	94.34			
								POTENTIAL OF CAPABILITIES: 386.07	274.78
								TOTAL POTENTIAL: 554.60	439.62
								100	79.26

GC= Gran Canaria; TF= Tenerife

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Finally, combining weights with the indicator values, an assessment for each one of the resources and capabilities is obtained. Results in Table 3 show that although the two islands have a similar potential of resources (GC: 168.53; TF: 164.84), Tenerife has a better available territorial resource for the development of wind power, while Gran Canaria has more complementary resources, mainly due to its better endowment of human capital. As far as the capabilities is concerned, Table 3 shows that Gran Canaria has a higher potential of capabilities than Tenerife (GC: 386.07; TF: 274.78). Specifically, Gran Canaria shows a better performance in the proportion of renewable energy over the total electrical energy, as well as in innovative behaviour indicators. Tenerife enjoys a better governance because although Gran Canaria outperforms Tenerife in terms of management efficiency and promotion of the industry by the insular government, the latter has received more funds for the development of the sector, and it also reaches a sounder coordination between the administration and industry firms. Concerning the total potential of resources and capabilities, Tenerife only accounts for a 79.26% of Gran Canaria.

With this evaluation a radial graph that defines a polygon for each island analysed is drawn. Taking as a reference the national diamond [21], it is assumed that the key factors of territorial competitiveness are related each other with a mutual influence. Thus, "[…] their relationship is better characterized by a multiplicative combination than by an additive combination. A country in which all four determining factors show a medium value is more competitive than a country where two values are high and two are low" [15]. In this case, the measure of the competitiveness for each island was done with a six vertex polygon which represents the combination of its resources and capabilities (Fig. 6).

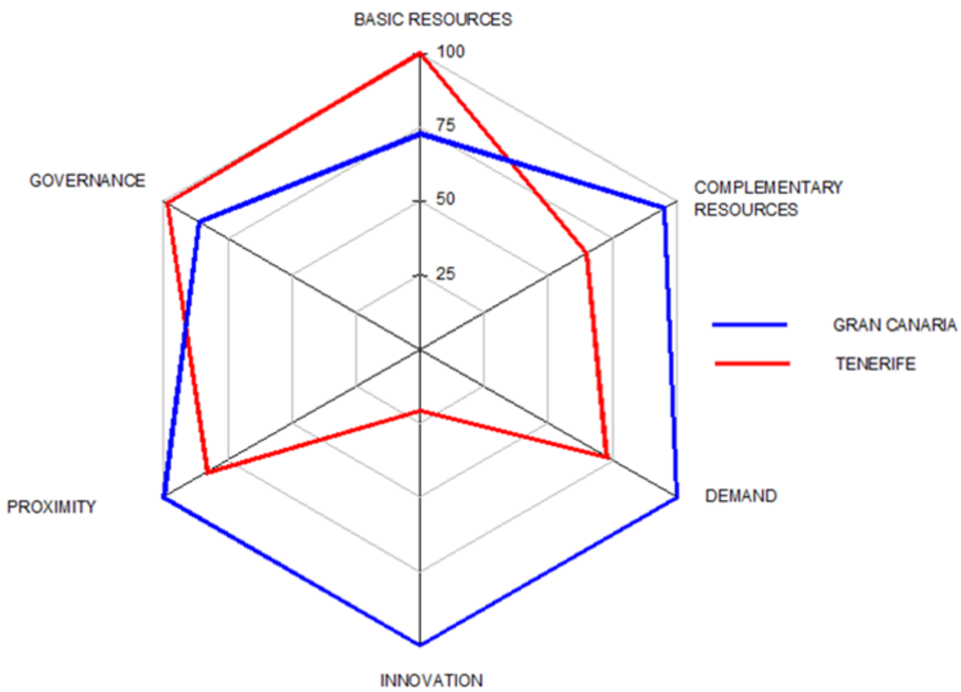

Figure 6. Comparative graph of resources and capabilities for Gran Canaria and Tenerife.

The territorial resources and capabilities assessment is then calculated as a ratio between the polygon area that represents each island and the maximum polygon area, with a rank of 100 in all the factors [18], as shown in Table 5. These results reveal that Gran Canaria achieves a better resources and capabilities assessment (100.00) compared to Tenerife (63.12).

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Table 5. Resources and capabilities assessment in Gran Canaria and Tenerife.

	GC	TF	GC	TF
Polygon area	22,245.3	14,040.4	100	63.12

Table 6 shows the values of the outcomes in Gran Canaria and Tenerife. Again, as each indicator is expressed in a different unit, they should be unified on a 100-basis. Moreover, as the outcomes are represented through several indicators, a weight is assigned to each of them using the pair wise comparisons method and the opinions of experts. Finally, combining the weights with the indicator values, an assessment for each one of the outcomes is obtained, showing that Gran Canaria has an outcome index over 40 points higher than Tenerife (GC: 100.00; TF: 58.04) due to a higher value in all of the indicators. The differences were found out mainly in industrial penetration, followed by productivity and social outcomes.

Table 6. Outcomes assessment in Gran Canaria and Tenerife.

	Elements	Indicators	GC	TF	GC	TF	Weights (%)	GC	TF
Outcomes	Productivity	Equivalent hours (kWh/kW)	2,52	2,10	100.00	83.26	50	100.00	59.67
		Tonnes of oil equivalent (toe)	18,29	6,61	100.00	36.11	20		
		Wind energy produced in relation to the total energy. (%).	5.74	2.07	100.00	36.06	30		
	Social outcomes	Reduction of CO_2 emissions (t)	167,21	60,39	100.00	36.11	60	100.00	61.67
		Company survival rate (years)	5	5	100.00	100.00	40		
	Industrial penetration	Wind energy firms (%).	0.13	0.08	100.00	61.54	50	100.00	52.77

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	Ratio wind power installed per number of inhabitants (w/inhabitant).	92.76	40.81	100.00	44.00	50
		TOTAL OUTCOMES			300.00	174.11
GC= Gran Canaria; TF= Tenerife					100.00	58.04

Based on the same criterion used with resources and capabilities, a mutual influence between outcomes is also assumed. Therefore, this relation is better represented by the value of a polygon area (see Fig. 7).

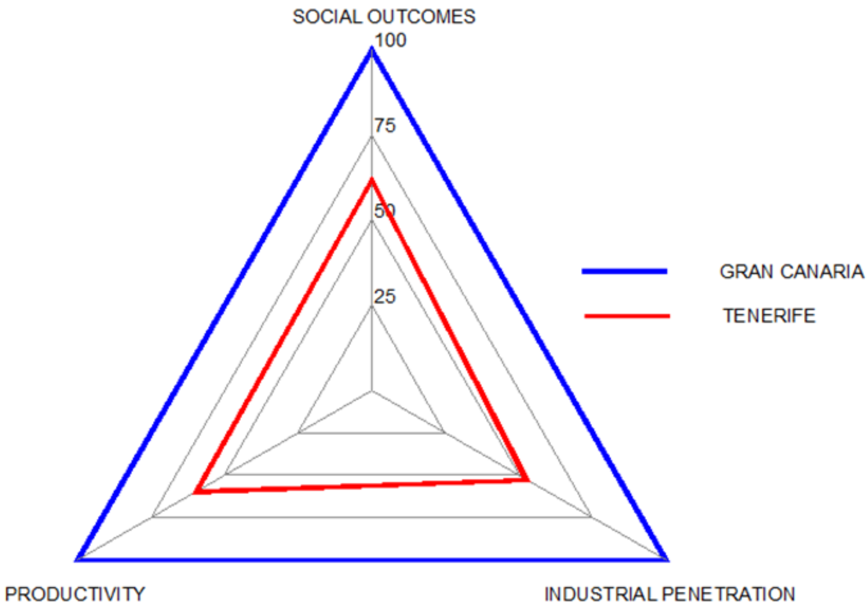

Figure 7. Comparative outcomes for Gran Canaria and Tenerife.

The territorial outcomes assessment is then calculated as a ratio between the triangle area that represents each island and the maximum triangle area, with a rank of 100 in all the factors [18], as shown in Table 7.

Table 7. Outcomes assessment in Gran Canaria and Tenerife.

	GC	**TF**	**GC**	**TF**
Polygon area	12,990.4	4,366.1	100	33.61

Once all the indicators in the model have been quantified (resources, capabilities, and outcomes), then the method goes on to calculate a territorial competitiveness index as the ratio between the value

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of outcomes and the value of resources and capabilities for each island. Thus, Gran Canaria obtains a territorial competitiveness index of 1 (100/100) and Tenerife gets an index of 0.53 (33.61/63.12). This means that Gran Canaria obtains nearly twice the performance of Tenerife with regards to their resources and capabilities.

4. Discussion and conclusions

This study has proposed a new approach to evaluate the competitiveness of two insular territories in the renewable energy sector from the resource-based view. The assessment of all the available resources and capabilities is particularly sensitive in islands where a structural handicap that hinder their social and economic development usually exists [85,19]. This insular disadvantage is notably significant in relation to the energy supply as it depends on the imports of oil products [5-7]. In sum, this methodological proposal goes beyond calculating a territorial competitiveness index to rank the territories, as it also relates such index with the socio-economic outcomes achieved [14], thus evaluating the ability of the territory to exploit its own resources and capabilities for the sustainable development of the sector. Hence, this research is in line with Praene et al. [86], who states that "[…] the deployment of any project in the energy field has to take into account economic, technological and social aspects in order to prove sustainable".

The proposed model has been empirically tested carrying out a comparative analysis of Gran Canaria and Tenerife, two outermost European islands. Based on the assumptions of the proposed model, those territories that reach better performance with less resource endowment are considered more competitive. Compared to Tenerife, the results show that Gran Canaria obtains almost twice the performance from the resources located in the territory. The reason for this difference is that the sector of wind power on the island of Gran Canaria has a better resource endowment, mainly complementary resources, while the basic resource value is lower than in the island of Tenerife. Concerning capabilities, Gran Canaria outperforms Tenerife due to demand, innovation and proximity. However, in Tenerife there is a strongest governmental and institutional support. Therefore, we can affirm that capability development is a key factor to better exploit the territorial resource endowment in order to achieve a competitive advantage.

This paper makes a significant academic contribution to the field of regional studies by providing a clearer and more precise distinction between the concepts of basic resources, complementary resources and capabilities, which represent the key factors to determine the competitiveness of a territory. Thus, policy makers can benefit from this new competitiveness approach to formulate strategies and policies to foster better outcomes in their geographic areas. On the basis of the information that the empirical application of the model shows, a land use policy that strengthens those areas with better conditions for the development of wind power industry can be formulated. This could be particularly important in an insular context, since it is in this type of territories where these tools are especially relevant to plan the best use of the limited land, in order to ensure its sustainability [6,8,87]. Therefore, the results of this research enable the strategic decision making aimed at: (a) environmental preservation, delimiting perfectly the areas where it is feasible to place a particular activity; (b) economic viability, classifying the territory according to its suitability for the economic development; and (c) social equity, allowing to plan taking into account both social needs and available resources in the territory.

Finally, some limitations of the present work must be recognised. First, it is necessary to consider that certain territorial variables of resources, capabilities and outcomes have not been included in this work, so the proposed model might be improved in future research. Second, because the territorial rankings that could be obtained through the methodology should be understood within each individual research context, it would be interesting to replicate the model within other territories and/or sectors such as tourism, agro-food, commerce, transport and other types of renewable energy industries. To this end, indicators should be re-designed so that they get closer to the selected context configuration. Additionally, the synergy among different sectors that are potentially complementary should be studied, in order to find out whether that synergy contributes to improve territorial competitiveness or not.

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